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SUPREME COURT, U.S.

No. 335

IN THE

United States Court of Appeals

FOR THE SEVENTH CIRCUIT

No. 11927

SOLAR CORPORATION, BY MERGER NOW GAMBLE-SKOGMO, INC.
Plaintiff-Appellant

vs.

BORG-WARNER CORPORATION
Defendant-Appellee

Appeal from the United States District Court for the Northern District of Illinois, Eastern Division.

Honorable
Philip L. Sullivan,
Trial Judge

JOINT APPENDIX

Hayward-Court Brief Printing Company, Minneapolis 15, Minnesota

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IN THE UNITED STATES COURT OF APPEALS
FOR THE SEVENTH CIRCUIT

SOLAR CORPORATION, BY MERGER NOW GAMBLE-SKOGMO, INC.
Plaintiff-Appellant

vs.

BORG-WARNER CORPORATION
Defendant-Appellee

No. 11927.

STATEMENT

(Per Rule 12(c) U. S. C. A. 7th)

1. The Complaint herein was filed July 6, 1953, by Solar Corporation, a Delaware corporation, with its principal place of business at Milwaukee. At such time and until June 2, 1955, plaintiff, said Solar Corporation, was a wholly owned subsidiary of Gamble-Skogmo, Inc., a Delaware corporation, with its principal place of business at Minneapolis, Minnesota.

2. On June 2, 1955, said Solar Corporation merged with said Gamble-Skogmo, Inc., and said Gamble-Skogmo Inc., became the surviving corporation, succeeding to all of the rights, liabilities and obligations of Solar Corporation.

3. By Stipulation, dated August 10, 1955, the name of the original party plaintiff herein was changed to "Solar Corporation, by merger now Gamble-Skogmo, Inc.," and, as such, is now the party plaintiff-appellant herein.

4. The defendant Borg-Warner Corporation is an Illinois corporation, with its principal place of business at Chicago, Illinois, and there has been no change in its corporate name or status since the Complaint was filed.

5. The defendant's Answer to the Complaint was filed October 30, 1953, and was amended February 15, 1954.

6. The trial, before Honorable Philip L. Sullivan, without a jury, was commenced on April 23, 1956, and concluded April 27, 1956.

7. Judgment for defendant was entered September 25, 1956, and plaintiff filed its Notice of Appeal on October 24, 1956.

2 Pleas had at a regular term of the United States District Court for the Eastern Division of the Northern District of Illinois begun and held in the United States Court Rooms in the City of Chicago in the Division and District aforesaid on the first Monday of September being the 3rd day thereof in the Year of Our Lord One Thousand Nine Hundred Fifty-Six and of the Independence of the United States of America, the 181st Year.

Present:

Honorable John P. Barnes, Chief District Judge.
Honorable William H. Holly, District Judge.
Honorable Philip L. Sullivan, District Judge.
Honorable Michael L. Igoe, District Judge.
Honorable William J. Campbell, District Judge.
Honorable Walter J. LaBuy, District Judge.
Honorable J. Sam Perry, District Judge.
Honorable Win G. Knoch, District Judge.
Honorable Julius J. Hoffman, District Judge.
Roy H. Johnson, Clerk.
William W. Kipp, Sr., Marshal.

Tuesday, Sept. 25, 1956.

Court met pursuant to adjournment.

Present: Honorable Philip L. Sullivan, Trial Judge.

4 IN THE UNITED STATES DISTRICT COURT
Northern District of Illinois,
Eastern Division.

SOLAR CORPORATION
Plaintiff
vs.
BORG-WARNER CORPORATION
Defendant

No. 53-C-1510
Civil Action

COMPLAINT

(Filed July 6, 1953.)

Plaintiff, for its cause of complaint herein, alleges that:

1. Plaintiff is a corporation organized under the laws of the State of Delaware, with its principal place of business at Milwaukee, in the County of Milwaukee, and State of Wisconsin, and manufactures and sells clothes washing machines through a division known as Beam Manufacturing Company located at Webster City, Iowa.

2. Defendant is a corporation organized under the laws of the State of Illinois, with its principal place of business at Chicago, in the County of Cook, and State of Illinois, and manufactures and sells clothes washing machines through a division known as Norge, also located in Chicago, Illinois.

3. Jurisdiction of this Court is based on the Patent laws of the United States of America.

4. On May 17th, 1949, United States Letters Patent No. 2,470,140, for Washing Machine Having Rotatable Tub

With Upper And Lower Discharge Means was duly and legally issued to plaintiff, as assignee of the entire right, title and interest therein from George P. Castner, the inventor-applicant for such patent, and from such date of issue until the patent was surrendered March 10th, 1953, for reissue purposes, plaintiff was at all times the sole and exclusive owner of said Letters Patent.

5. On December 8th, 1952, the aforesaid George P. Castner, by and with the approval and assent of plaintiff, made application (Serial No. 324,862), for reissue of said patent No. 2,470,140, and on March 10th, 1953, a Reissue patent No. Re. 23,626, was duly and legally granted to plaintiff, as the original assignee from George P. Castner, and since such date of reissue has been and still is the sole and exclusive owner of said Reissue patent. Claims 1 to 5, inclusive, of the reissue patent No. 23,626 are identical with claims 1 to 5 of the original patent No. 2,470,140, and claims 6 to 8, inclusive, of the reissue patent were added in the reissue proceedings.

6. On April 7th, 1953, United States Letters Patent No. 2,633,727, for Washing Machine Having Rotary Tub With Separate Discharge Means, was duly and legally issued to plaintiff, as assignee of the entire right, title and interest therein from Walter J. Roth, the inventor-applicant for such patent, and since such date of issue plaintiff has been and still is the sole and exclusive owner of said Letters Patent.

7. Plaintiff has invested large sums of money in developing and putting into practical use the inventions covered by the aforesaid patents, and in building a demand therefor, and in preparing to supply and supplying such demand; the said patented inventions are of great utility

and practical value, and have gone into extensive commercial use throughout the United States.

8. The public in general has acknowledged the validity of the aforesaid patents and has acquiesced in and respected plaintiff's rights therein and thereunder, several licenses having been granted to large and prominent manufacturers of clothes washing machines, and substantial royalties having been paid by such licensees to plaintiff.

9. Defendant did, during the period between May 7th, 1949 and March 10th, 1953, infringe said (Castner) Letters Patent No. 2,470,140, by making and selling clothes washing machines which embodied the patented invention thereof, within this judicial district and elsewhere.

10. Defendant has, since March 10th, 1953, and prior to the filing of this complaint, infringed the said (Castner) Reissue Patent No. 23,626, by making and selling clothes washing machines which embody the patented invention thereof, within this judicial district and elsewhere, and, on information and belief, will continue to do so unless enjoined by this Court.

11. Defendant has, since April 7th, 1953, and prior to the filing of this complaint, infringed the said (Roth) Letters Patent No. 2,633,727, by making and selling clothes washing machines which embody the patented invention thereof, within this judicial district and elsewhere, and, on information and belief, will continue to do so unless enjoined by this Court.

12. The clothes washing machines manufactured and sold by plaintiff under the patents in suit have been duly marked with notice of the patents in suit, as required by statute, and in addition plaintiff has, prior to the commence-

ment of this suit, notified defendant of the infringement of each of said patents and has offered defendant a license thereunder, but defendant has refused to accept a license, and notwithstanding its knowledge of the patents and the infringements thereof defendant is continuing with the infringements complained of.

13. Defendant has profited by said infringements and plaintiff has been damaged by said infringements, and plaintiff will be irreparably damaged unless an accounting is ordered and an injunction is issued by this Court.

14. If the aforesaid infringements are permitted to continue further losses and damages and irreparable injury will be sustained by plaintiff, and, on information and belief, such continued infringements will result in further injury, loss and damage to plaintiff in that such infringement by defendant will have the effect of encouraging or inducing others to infringe upon said patents in suit, and thereby greatly depreciate the value thereof for which injury, loss and damage money compensation will be inadequate.

Wherefore, plaintiff prays:

1. For a permanent injunction, enjoining and restraining the defendant, its officers, directors, associates, attorneys, clerks, agents, servants, workmen, and employees, and each of them, from directly or indirectly making or causing to be made, using or causing to be used, selling or causing to be sold, advertising or offering for sale or use, clothes washing machines embodying or employing the inventions set forth and claimed in said United States Letters Patents No. 2,633,727, and Reissue No. 23,626, or any material or substantial parts thereof, or from infringing upon or contributing to the infringement of said patents in any way whatsoever.

2. For an accounting of profits and damages with respect to the infringement of Patent No. 2,470,140, Reissue Patent No. 23,626, and Patent No. 2,633,727.

3. For an assessment of costs in this suit; for reasonable attorneys' fees; and for such other and further relief as the Court may deem just.

BROWN, JACKSON, BOETTCHER & DIENNER,
By EDWARD C. GRELLE,
1550 Monadnock Block,
53 West Jackson Boulevard,
Chicago 4, Illinois,
Attorneys for Plaintiff.

Of Counsel:
ANDREW E. CARLSEN and
DOUGLAS L. CARLSEN
1143 Plymouth Building,
Minneapolis 3, Minnesota.

12 IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

ANSWER

(Filed October 30, 1953.)

Now comes Borg-Warner Corporation, defendant, in the above styled and numbered cause, and responds in the following terms to plaintiff's Bill of Complaint, as particularized by the Stipulation dated October 1, 1953, to-wit: Section 1. Specific Response to Plaintiff's Affirmative Allegations in re All Three Patents in Suit.

First Defense

1. Answering Paragraph "1", defendant admits the allegations therein contained.

2. Answering Paragraph "2", defendant admits the allegations therein contained.

3. Answering Paragraph "3", defendant admits the allegations therein contained.

4. Answering Paragraph "4" of said Complaint (and as supplemented by said Stipulation), defendant admits that on May 17, 1949, United States Letters Patent No. 2,470,140, for "Washing Machine Having Rotatable Tub With Upper And Lower Discharge Means" was issued to the plaintiff, as Assignee of the entire right, title and interest therein of George P. Castner, the Applicant for such patent, and defendant further admits on information and belief that from such date of issue until the patent was surrendered March 10, 1953, for reissue purposes, plaintiff was at all times the sole and exclusive owner of said Letters Patent. Defendant denies, however, that said patent was duly and legally issued. Defendant further denies that said George P. Castner was the first inventor of the subject matter of Claim 4, which claim is specified in said Stipulation as the claim on which plaintiff will rely.

5. Answering Paragraph "5" of the Complaint, defendant admits that the aforesaid George P. Castner made application (Serial No. 324,862) for reissue of said Patent No. 2,470,140, and on March 10, 1953, a Reissue Patent No. 23,626 was granted to plaintiff, as the original Assignee of George P. Castner, and on information and belief defendant admits that since such date of reissue the plaintiff has been and still is the sole and exclusive owner of

said reissue patent. Defendant denies, however, that said Reissue Patent No. 23,626 was duly and legally granted. Defendant admits that Claims 1 to 5, inclusive, of the Reissue Patent No. 23,626 are identical in wording with Claims 1 to 5 of the original Patent No. 2,470,140.

Defendant admits that Claims 6 to 8, inclusive, of the reissue patent were added in the reissue proceedings.

6. Answering Paragraph "6" of the Complaint (and as supplemented by said Stipulation), defendant admits that on April 7, 1953, United States Letters Patent No. 2,633,727 for "Washing Machine Having Rotary Tub With Separate Discharge Means" was issued to plaintiff, as Assignee of the entire right, title and interest therein from Walter J. Roth, the Applicant for such patent, and defendant admits on information and belief that since such date of issue plaintiff has been and still is the sole and exclusive owner of said Letters Patent. Defendant, however, denies that said patent was duly and legally issued to plaintiff, and further denies that said Applicant, Walter J. Roth, was the first inventor of the subject matter of Claims 1 and 3 of said patent, which claims are specified in said Stipulation as being the claims on which plaintiff will rely.

7. Answering Paragraph "7", defendant is without knowledge and information sufficient to form a belief as to the truth and allegations of said Paragraph, and it, therefore, denies the same, and leaves plaintiff to its proofs.

8. Answering Paragraph "8", defendant is without knowledge and information sufficient to form a belief as to the truth and allegations of said paragraph, and it, therefore, denies the same, and leaves plaintiff to its proofs.

9. Answering Paragraph "9" of the Complaint, defendant denies each and every allegation and specifically as-

serts that it has not infringed Claim 4 of said Patent No. 2,470,140, the claim plaintiff specifies in said Stipulation of October 1, 1953, that it will rely on by making and selling clothes washing machines which embodied the alleged patented invention thereof, within this Judicial District or elsewhere.

10. Answering Paragraph "10" of the Complaint, defendant denies each and every allegation therein contained and specifically asserts that it has not infringed any valid claim of said Reissue Patent No. 23,626, and more specifically states that it has not infringed Claims 4, 6, 7 and 8 of said Reissue Patent No. 23,626, said claims being the claims specified by plaintiff that it will rely on, by making and selling clothes washing machines which embody the alleged patented invention thereof, within this Judicial District and elsewhere.

11. Answering Paragraph "11" of the Complaint, defendant denies each and every allegation therein contained and specifically asserts that it has not infringed any valid claim of Letters Patent No. 2,633,727, by making and selling clothes washing machines which embody the alleged patented invention thereof, within this Judicial District and elsewhere.

12. Defendant answering Paragraph "12" of the Complaint admits that prior to the commencement of this suit plaintiff notified defendant of the alleged infringement of Patent No. 2,470,140 and Reissue Patent No. 23,626. Defendant further admits that plaintiff approached defendant on the subject of defendant taking a license under plaintiff's patents, but that no formal license was submitted or considered. Defendant denies that it had notice from plaintiff prior to the commencement of the suit of the alleged

infringement of Patent No. 2,633,727. Further, defendant is without knowledge or information that "The clothes washing machines manufactured and sold by plaintiff under the patents in the suit have been duly marked with notice of the patents in suit, as required by statute, * * *" sufficient to form a belief as to the truth thereof, and it, therefore, denies the same and leaves plaintiff to its proof. Defendant further denies each and every other allegation of said paragraph.

13. Defendant answering Paragraph "13", denies each and every allegation of said paragraph.

14. Defendant answering Paragraph "14", denies each and every allegation thereof.

Second Defense

15. Upon information and belief, defendant avers that each of patents, Numbers, 2,470,140, Reissue 23,626 and 2,633,727, is invalid and void, because the patentee was not the original and first inventor, and in any event not the sole inventor of the subject matter described and claimed therein, and because the same in all its material and substantial parts was invented, known to, and used by, others in this country before patentee's alleged invention or discovery thereof, and was described in patents granted on applications by others filed in this country before his alleged invention or discovery thereof and was patented and described in printed publications in this and foreign countries before his alleged invention or discovery thereof, and more than one year prior to his application for patent, and was in public use and on sale in this country for more than one year prior to his said applications.

(a) The prior patents and printed publications relating to the subject matter of Patent No. 2,470,140, insofar as they have at present been ascertained, are specified in the annexed "Schedule A"; and those relating to the subject matter of Reissue Patent No. 23,626, insofar as they have at present been ascertained are specified in the annexed "Schedule B"; and those relating to the subject matter of Patent No. 2,633,727, insofar as they have at present been ascertained, are specified in the annexed "Schedule C."

(b) The instances of prior invention, prior knowledge and use by others, and prior public use and sale, relating to the subject matter of Patent No. 2,470,140, insofar as they have at present been ascertained, were by the patentees of the patents and by the assignees thereof, and by the authors of the printed publications specified in "Schedule A" above mentioned, at the places set forth in these patents and publications, and elsewhere in the United States; and those relating to the subject matter of United States Reissue Patent No. 23,626, insofar as they have at present been ascertained, were by the patentees of the patent, by the assignees of the patent, and by the authors of the printed publication specified in the annexed "Schedule B"; and those relating to the subject matter of United States Letters Patent No. 2,633,727, insofar as they have at present been ascertained, were by the patentees of the patent, the assignees of the patent, and by the authors of the printed publications specified in the annexed "Schedule C." Machines embodying structure anticipatory of the claims in issue of all three patents in suit were manufactured by Frigidaire Division of General Motors Corporation, Dayton, Ohio, prior to June 1, 1942.

16. Upon information and belief, defendant further avers that each of patents, Numbers 2,470,140, Reissue 23,626, and 2,633,727, is likewise invalid and void for the following additional reasons:

(a) Because no inventive concept or act was required to devise the alleged invention described and claimed by the patent in view of the state of the art existing prior to the alleged invention;

(b) Because the differences between the alleged invention described and claimed by the patent and the prior art were such that the subject matter as a whole would be obvious to a person having ordinary skill in the art to which the patents pertain, and such subject matter consequently involved nothing more than mere mechanical skill in the selection and adaptation of elements or devices well known in the prior art;

(c) Because the alleged invention described and claimed by the patent does not constitute patentable subject matter within the meaning of the patent law;

(d) Because each of the claims in suit covers a mere aggregation of parts, or, in any event, nothing more than an exhausted combination.

17. Upon information and belief, defendant also avers that, by reason of the respective proceedings in the Patent Office in connection with the prosecution of the applications for each of Patent Numbers 2,470,140, Reissue 23,626 and 2,633,727, and the admissions and representations made therein by or on behalf of the Applicant in order to induce the grant of each of said patents, plaintiff is estopped to claim for any of said patents a construction, were the same otherwise possible, such as would cause it to cover any mechanism or device of defendant.

Third Defense

18. Defendant further answering avers, on information and belief, that each of the claims of said Reissue patent, and particularly those specified by plaintiff in the Stipulation dated October 1, 1953, are invalid and of no effect for the following additional reasons:

(a) The same are not properly based or supported by the disclosure of the application as originally filed in the Patent Office for said original Patent No. 2,470,140;

(b) The alleged errors in said original patent did not arise from inadvertence, accident or mistake within the meaning of the law relating to reissues;

(c) Plaintiff and Castner did not proceed with due diligence and they unduly delayed to correct the alleged errors in said original patent by seeking such reissue, and particularly by seeking such reissue after having full knowledge and information as to defendant's production structures described in said Stipulation, and further until defendant had pointed out to plaintiff the limitations in said Claim 4 and other claims of said original patent whereby said claims were not infringed;

(d) The alleged invention which is now asserted by plaintiff to be covered by each of the Reissue claims, and particularly Claims 4, 6, 7 and 8, or all substantial and material parts thereof, had long before and more than one year prior to the filing date of the application for reissue patent been publicly used and sold and on sale in this country by defendant and various other persons and concerns. Among such persons and concerns are the dealers, purchasers and users of Norge washers which plaintiff charges to be infringed—a charge denied, however, by defendant.

Wherefore defendant prays:

1. That Patent No. 2,470,140 and each of the claims thereof be adjudged invalid and void;

2. That Patent Reissue 23,626 and each of the claims thereof be adjudged invalid and void;

3. That Patent No. 2,633,727 and each of the claims thereof be adjudged invalid and void;

4. That Patent No. 2,470,140 be adjudged non-infringed by defendant;

5. That Patent Reissue 23,626 be adjudged non-infringed by defendant;

6. That Patent No. 2,633,727 be adjudged non-infringed by defendant;

7. That an Injunction be issued, perpetually enjoining and restraining plaintiff and anyone in privity with plaintiff from bringing or prosecuting against defendant, its agents, vendees, or others in privity with them, any action at law or suit in equity charging infringement of said Patents 2,470,140, Reissue 23,626 and 2,633,727;

8. That the Bill of Complaint and all causes of action set forth therein be dismissed with costs to defendant; and

9. That the Court may grant such other and further relief as may be just and proper.

C. G. STALLINGS,
310 South Michigan Avenue,
Chicago 4, Illinois,
Attorney for Defendant.

Of Counsel:
LYLE S. MOTLEY
JOSEPH M. GARTNER

Service of copy hereof is admitted this 30th day of October, A. D., 1953.

EDWARD C. GRELLE,
Counsel for Plaintiff.

Schedule A

References Against Patent No. 2,470,140

Patent No.	Patentee	Application Date	Issue Date
2,274,402	G. W. Dunham	Dec. 29, 1939	Feb. 24, 1942
2,346,158	J. B. Dyer	June 29, 1940	April 11, 1944
2,331,897	J. B. Dyer	Jan. 8, 1940	Oct. 19, 1943
2,378,392	R. R. Candor	Oct. 28, 1940	June 19, 1945
974,075	W. O. King	Mar. 7, 1910	Oct. 25, 1910
2,313,928	J. B. Dyer	Apr. 24, 1939	Mar. 16, 1943

Schedule B

References Against Patent No. Re. 23,626

Patent No.	Patentee	Application Date	Issue Date
2,274,402	G. W. Dunham	Dec. 29, 1939	Feb. 24, 1942
2,346,158	J. B. Dyer	June 29, 1940	Apr. 11, 1944
2,331,897	J. B. Dyer	Jan. 8, 1940	Oct. 19, 1943
2,378,392	R. R. Candor	Oct. 28, 1940	June 19, 1945
974,075	W. O. King	Mar. 7, 1910	Oct. 25, 1910
2,313,928	J. B. Dyer	Apr. 24, 1939	Mar. 16, 1943

Schedule C

References Against Patent No. 2,633,727

Patent No.	Patentee	Application Date	Issue Date
2,637,188	T. R. Smith	August 6, 1949	May 5, 1953
2,274,402	G. W. Dunham	Dec. 29, 1939	Feb. 24, 1942
1,603,757	A. W. Farrell	July 30, 1925	Oct. 19, 1926
1,850,821	W. L. Wright	July 30, 1926	Mar. 22, 1932
2,470,140	G. P. Castner	Dec. 21, 1945	May 17, 1949
974,075	W. O. King	Mar. 7, 1910	Oct. 25, 1910
2,313,928	J. B. Dyer	Apr. 24, 1939	Mar. 16, 1943

68 IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

FINDINGS OF FACT AND CONCLUSIONS OF LAW

(Filed Sept. 25, 1956.)

A. The Action And The Parties

1. Plaintiff, Solar Corporation, by merger now Gamble-Skogmo, Inc., is a Delaware corporation. Defendant, Borg-Warner Corporation, is an Illinois corporation at Chicago, Illinois.

2. Plaintiff sues under the patent laws of the United States charging infringement of Castner Patent No. 2,470,140 (claims 1, 4 and 5), its Reissue No. 23,626 (claims 1, 4, 5, 6, 7 and 8), and Roth Patent No. 2,633,727 (claims 1 and 3), which plaintiff or its predecessors have owned since issue by manufacture, use, and sale by defendant of washing machines. Defendant admits infringement of Castner claim 1, and Roth claims 1 and 3, if valid.

B. The Patents In Suit

3. Plaintiff's Castner Patent No. 2,470,140 issued May 17, 1949, for "Washing Machine Having Rotatable Tub With Upper And Lower Discharge Means", and was reissued as Re. No. 23,626 on March 10, 1953, on an application filed December 8, 1952, with claims 1 to 5 inclusive, identical, and new claims 6, 7 and 8 in the Reissue.

4. About March 9, 1951, defendant made its first washing machine, charged to infringe patents Nos. 2,470,140 and Reissue 23,626, and has made and sold its second design washing machine (which it disclosed to plaintiff in June, 1952) from about November 18, 1952, to date.

5. Nothing in claim 1 of Patent 2,470,140 limits the shape or position of the "recess" which is the sediment trap in the bottom of the tub, except that the wall pierced by the outlet must be farther from the center of the tub than other parts of the trap wall.

6. Claims 4, 5, 6, 7 and 8 of the Reissue 23,626 (as well as claims 4 and 5 of the original 2,470,140) are limited, either by their language or by Castner's sworn representations to the Patent Office that his patent was inoperative unless confined to a structure having:

> "a construction in which a dished bottom part 14 of the tub terminates in a concentric or substantially annular recess or trap so that all areas of the dished tub bottom will drain freely and directly into the trap."

7. Roth Patent No. 2,633,727 issued April 7, 1953, on application filed April 29, 1952, for "Washing Machine Having Rotary Tub With Separate Discharge Means". The only distinction found in the Roth Patent No. 2,633,727 over Castner patent 2,470,140 is in:

> "the inlet end of the tubular member being located in advance of its outlet end"

which specifies the twisted or trailing discharge tube, which is asserted to be the patented invention.

8. Plaintiff's principal witness Castner admitted that he had not tested the Roth device comparatively and that he had not been able to determine its advantage, if there be any. Plaintiff offered no proof to show that the trailing tube effected any improvement. Demonstration, in open court, of a washing machine made by one of plaintiff's licensees with first a trailing tube as shown in the Roth patent, and then the tube with its discharge outlet leading its inlet, disclosed no observable increase in speed of discharge with the trailing tube.

C. The History And Problems Of Sediment Removal

9. Washing machines having an imperforate water-holding tub and employing an agitator reciprocable about a vertical axis, and automatic washing machines of that type with a tapered tub adapted for centrifugal removal of the water therein were known long before the application for the patents in suit.

10. A sediment trap in the bottom of a vertical axis agitator automatic washing machine with imperforate tub to receive heavy particles settling from the wash water and to be emptied during centrifugal drying by spinning the tub was disclosed in the Dunham patent issued in 1942, and an annular sediment trap concentric to the axis of rotation of the agitator was disclosed in the Dyer patent of 1943. Discharge tubes in which the outlet end trails the inlet end thereof with respect to the direction of rotation of the spinning tub were shown in the Smith (applied for in 1949) and Wright (1932) patents on washing machines, and the King patent of 1910 on an ore concentrator, all before application for the Roth patent.

D. The Teachings Of The Prior Art Relied Upon By Defendant.

11. Patent to King No. 974,075 of 1910 shows an ore concentrator used to separate or concentrate ore, in a slurry state, having discharge tubes in which the inlet end leads the outlet end, with respect to the direction of rotation of the tub.

12. Patent to Wright No. 1,850,821, of 1932, shows a washing machine with perforated inner tub within an outer imperforate tub, and attached to the inner (spinning) tub a plurality of water-discharge tubes which project down

into the outer (imperforate and stationary) tub. These tubes have inlet ends leading the outlet ends thereof, and during spinning of the inner tub, the water in the outer tub is discharged through the tubes by centrifugal force and the force of inertia.

13. Dunham patent 2,274,402 of 1942 shows an automatic washing machine having a tub which is tapered upwardly so that during centrifugal drying the main body of the water is discharged through a series of outlet holes high on the wall of the tub. Dunham shows a plurality of sediment traps arranged under the perforated bottom of the tub into which sediment in the wash water may settle, the traps being extended into vertical tubes through which, during centrifugal drying, heavy particles which have found their way into the sediment traps will be discharged along with the water therein. It is obvious from the construction shown in Dunham's Fig. 1 that any sedimentary material which finds its way into the sediment trap thereof will be centrifugally discharged through the attached tube during spinning. Testimony of plaintiff's witness Dugger to the contrary gave no reason for his conclusion, and the Court accepts the testimony of defendant's witness Colburn that the trap will empty, a fact impliedly conceded by Castner in applying for a reissue patent because of his discovery of the Dunham patent.

14. Dyer Patent No. 2,313,928, of 1943, discloses a domestic washing machine with vertical agitator having a dished or funneled bottom portion terminating in an annular sediment trap. Heavy material which collects in this trap is centrifugally discharged through adjacent passages and out over the sidewall of the outer riser during spinning.

15. Smith Patent No. 2,637,188, of 1953 (applied for August 6, 1949), discloses an automatic washing machine of the double-walled-tub variety having a plurality of holes around the base of the tub, through which sediment and heavy materials will drop into a lower trap which is emptied during spinning by centrifugal force and inertia, the latter provided by a plurality of inclined ribs or vanes situated between the tub walls.

E. Infringement

16. Claim 4 of Castner No. 2,470,140 and Re. 23,626 is the broadest claim other than claim 1 in these patents, and if defendant does not infringe claim 4 it does not infringe any of claims 4, 5, 6, 7 and 8. In the reissue oath Castner attempts to limit claim 4 (and all other claims) of his patent

> "to define a construction in which a dished bottom part 14 of the tub terminates in a concentric or substantially annular recess or trap so that all areas of the dished tub bottom will drain freely and directly into the trap."

17. Neither the Norge first or second design infringes claim 4 of the Castner patents because the Norge tub does not have a funneled or "dished bottom part", and is not one in which the bottom portion "terminates in a concentric or substantially annular recess or trap." Additionally, in the Norge machines it is not true that "all areas of the dished tub bottom will drain freely and directly into the trap," because that phrase defines an annular lip about a completely open annular recess, not present in the Norge constructions, which are much closer to the structure of Dunham than to Castner, and do not permit "all areas of the dished bottom part * * * (to) drain freely and directly into the trap."

F. Validity

18. Claim 1 of the Castner patents is anticipated by the Dunham Patent No. 2,274,402. Every limitation of claim 1 is found in Dunham and Castner admitted his patent to be inoperative over Dunham unless limited to the open annular trap, not demanded by claim 1.

19. Claims 4, 5, 6, 7 and 8 of Castner Reissue 23,626 (and claims 4 and 5 of Castner No. 2,470,140) fail to distinguish inventively over the Dunham patent, either alone or in combination with the Dyer patent. Dunham discloses a structure which anticipates every limitation of claims 4 through 8, with the exception of the "dished bottom part" which

> "terminates in a concentric or substantially annular recess or trap so that all areas of the dished tub bottom will drain freely and directly into the trap."

It was not invention over Dunham to provide a single annular trap in conjunction with the funneled bottom after the Dyer patent had shown the funneled bottom construction with the annular sediment trap.

20. Claims 1 and 3 of Roth patent No. 2,633,727 are anticipated by and not inventive over the Smith patent No. 2,637,188 and are not inventive over original Castner patent No. 2,470,140. The Smith patent was applied for August 6, 1949, Roth on April 29, 1952, and defendant's second form of wash machine independently conceived in May, 1952, disclosing simultaneous independent production of a structure incorporating the identical principle.

G. The Castner Reissue Patent And The Reissue Statute

21. The Castner reissue application was filed under the Reissue statute effective in December, 1952 (35 U. S.

C. §64), but none of the claims of the original patent were either cancelled or amended although admitted by Castner to be inoperative over Dunham. If neither claims nor specification were defective or inoperative, the application did not qualify under the reissue statute, and unchanged the claims remain inoperative and invalid.

H. Intervening Rights

22. Castner's original patent issued May 17, 1949. Defendant made and sold its first design washing machine on March 9, 1951, and the reissue patent issued on March 10, 1953, more than two years later. Defendant has intervening rights effective against claims 6, 7 and 8 of the reissue patent.

I. Commercial Success

23. Plaintiff has issued several licenses under a group of patents, covering numerous features in addition to sediment traps. Consideration for these licenses included other inducements besides royalties, such as engineering and technical assistance, use of dies, dissemination of "know how", purchase of parts, and other services supplied by plaintiff. The rate of royalties paid under these licenses was determined by whether the licensees used one or two licensed features, and use of any features more than two was free. It is impossible to attribute or allocate any portion of the royalties received by plaintiff as payment for the use of the patents in suit. No licensee has paid royalties for the use of the sediment trap alone.

24. Some of plaintiff's licensees have, at various times, plugged the sediment traps or left off the discharge tubes under conditions where inclusion of the alleged inventions would not have raised the royalty liability at all. Plaintiff

itself has been constructing an ever-increasing percentage (in 1955, over 29%) of its production of automatic washing machines without providing for automatic sediment ejection, by not providing an outlet hole or discharge tube from the sediment trap, thereby saving about forty cents per machine priced at an excess of one-hundred dollars at the factory.

Conclusions of Law

1. The Court has jurisdiction over the action and the parties.

2. Claim 1 of Patent No. 2,470,140 is invalid as anticipated by the prior art, and claims 4 and 5 thereof are invalid for failure to define any invention over the prior art.

3. Claim 1 of Reissue Patent No. 23,626 is invalid because anticipated by the prior art, and claims 4, 5, 6, 7 and 8 thereof are invalid for failure to define any invention over the prior art.

4. Claims 1 and 3 of Patent No. 2,633,727 are invalid as anticipated by the prior art and for want of invention.

5. Defendant has not infringed claims 4 and 5 of Patent No. 2,470,140, or claims 4, 5, 6, 7 and 8 of Reissue Patent No. 23,626.

Enter:

PHILIP L. SULLIVAN,
United States Judge.

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* * (Caption—53-C-1510) * *

JUDGMENT

(Filed Sept. 25, 1956.)

This cause having come on to be heard and Findings of Fact and Conclusions of Law having been entered today, it is hereby ordered and adjudged:

1. This Court has jurisdiction of the subject matter of this suit and the parties hereto.

2. Plaintiff is the owner of United States Letters Patent Nos. 2,470,140, Reissue No. Re. 23,626 and 2,633,727, and all rights to recover for infringement thereof.

3. Claims 1, 4 and 5 of Patent No. 2,470,140, claims 1, 4, 5, 6, 7 and 8 of Patent No. Re. 23,626, and claims 1 and 3 of Patent No. 2,633,727 are invalid and void.

4. Defendant has infringed claim 1 of Patent No. 2,470,140 and Reissue No. 23,626, and has infringed claims 1 and 3 of Patent No. 2,633,727, if valid.

5. Defendant has not infringed claims 4 and 5 of Patent No. 2,470,140, or claims 4, 5, 6, 7 and 8 of Patent No. Re. 23,626.

6. The Complaint herein is dismissed.

7. Defendant is awarded its costs taxable herein, to be taxed by the Clerk.

PHILIP L. SULLIVAN,
United States District Judge.

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* * (Caption—53-C-1510) * *

NOTICE OF APPEAL

(Filed Oct. 24, 1956)

Notice is hereby given that plaintiff herein now appeals to the United States Court of Appeals for the Seventh Circuit, from paragraphs 3, 5, 6 and 7 of the Judgment entered in this action on September 25, 1956.

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* * (Caption—53-C-1510) * *

STIPULATION PURSUANT TO RULE 12(a) OF THE RULES OF THE UNITED STATES COURT OF APPEALS FOR THE SEVENTH CIRCUIT AND RULE 75(o) OF THE FEDERAL RULES OF CIVIL PROCEDURE LIMITING ORIGINAL RECORD ON APPEAL

It is hereby stipulated by and between the parties, by their respective counsel, that the record to be transmitted to the United States Court of Appeals for the Seventh Circuit, shall comprise:

1. Complaint, filed 7/6/53;

2. Stipulation, dated 10/1/53, filed 10/5/53;

3. Answer, filed 10/30/53;

4. Plaintiff's Interrogatories, filed 12/9/53;

5. Defendant's Answers to Interrogatories, filed 1/26/54;

6. Resume of Plaintiff's Interrogatories and Defendant's Answers received in evidence during trial and marked Plaintiff's Exhibit;

7. Notice of additional prior art, filed 2/15/54;

8. Stipulation and Exhibit, dated 1/10/55, filed 2/10/55;

9. Stipulation, dated 6/23/55, filed 8/1/55;

10. Supplemental Stipulation, dated 4/22/55, filed 8/1/55;

11. Stipulation, dated 8/10/55, filed 9/8/55;

12. Transcript of Testimony, Volumes 1, 2 and 3;

13. Exhibits:

Plaintiff's Exhibits 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 (including 11(a), 11(b), 11(d), 11(e), 11(f), 11(g), 11(h), 11(i), 11(j), 11(k), 11(l), 11(m), 11(n), 12, 13, 14, 14A, 14Ph1, 14Ph2, 14Ph3, 14Ph4, 14Ph5, 15, 16, 17, 18, 18A, 19, 20, 21, 22, 23, 25, 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45 and 46;

Defendant's Exhibits A, B, C, D, E, F, G, H, H-A, H-B, I, J, K-1, K-2, K-3, L, K-4, K-5, K-6, M, K-7, K-8, K-9, N, K-10, K-11, K-12, O, K-13, K-14, K-15, P, Q, K-16, K-17, K-18, K-19, K-20, K-21, R, R-A, S, S-A, T, U, V and V-A;

14. Findings of Fact and Conclusions of Law, filed 9/25/56;

15. Judgment, filed 9/25/56;

16. Notice of Appeal, filed 10/24/56;

17. Statement under Rule 12(c);

18. Statement under Rule 12(d);

19. This Stipulation.

Dated: November 5, 1956.

EDWARD C. GRELLE,
53 West Jackson Blvd.,
Chicago 4, Illinois,
Attorney for Plaintiff-Appellant.

ROBERT C. WILLIAMS,
209 South LaSalle Street,
Chicago 4, Illinois,
Attorney for Defendant-Appellee.

IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

STIPULATION FOR JOINT APPENDIX

1. It is hereby stipulated that a joint printed Appendix to be filed herein, shall include the following:

a. An index.

b. Complaint.

c. Answer, as amended by Notice of Additional Prior Art.

d. Statement filed under C. A. Rule 12(c).

e. Findings of Fact and Conclusions of Law.

f. Judgment.

g. Notice of Appeal.

h. Stipulation of original record for appeal.

i. This Stipulation.

j. Abstract of defendant's Answers (filed January 26, 1954) to plaintiff's Interrogatories (filed December 9, 1953), in narrative form.

k. The following portions of the reporter's Transcript of Proceedings:

(Volume No. 1)

Page 72, line 5, through page 84, line 19.
Page 85, line 13, through page 94, line 4.
Page 95, line 6, through page 99.
Page 104, line 1, through page 129.
Page 131, line 1, through page 217.
Page 219, line 1, through page 278.

(Volume No. 2)

Page 280, line 1, through page 334.
Page 336, line 1, through page 400.

Page 402, line 1, through page 443, line 20.
Page 445, line 1, through page 449.
Page 451, line 2, through page 502.

(Volume No. 3)

Page 504, line 1, through page 727.

2. With reference to the documentary exhibits of both parties it is agreed that they shall be regarded as single copy physical exhibits not requiring reproduction, except, however, that each party may reproduce in its own appendix any documentary exhibit in evidence, and except further, that copies of all patents in evidence shall be found in the Joint Appendix.

3. Concerning machines and machine part exhibits, now in the custody of counsel for the respective parties, and any documentary exhibits that may be withdrawn by such counsel, it is agreed that all such exhibits are to be placed in the custody of the Clerk of this Court not less than ten days before the date assigned for hearing.

4. The printed Joint Appendix shall be filed within thirty days after the Record is filed pursuant to Rule 15(a) of this Court.

EDWARD C. GRELLE,
Attorney for Plaintiff.
ROBERT C. WILLIAMS,
Attorney for Defendant.

RESUME OF PLAINTIFF'S INTERROGATORIES AND DEFENDANT'S ANSWERS

(Filed April 23, 1956.)

(Answers by George P. F. Smith, Vice Pres. of B-W, dated Jan. 26, 1954.)

A set of interrogatories, propounded by plaintiff to defendant, was filed December 9th, 1953, pursuant to Rule 33 FRCP. On January 26th, 1954, defendant filed answers to certain of such Interrogatories, and filed objections to others. The facts evidenced by the answered Interrogatories are as follows.

1. In Par. 5 of its Answer to Complaint defendant admits that claims 1 to 5, inclusive, of the Castner original and reissue patents in suit, are "identical in wording". By using the qualifying expression "in wording" defendant here emphasizes the contention that

> "the admission did not extend to a legal interpretation that the claims were the same in the reissue patent as in the original patent or that they were entitled to the same scope or construction or that they were valid. By limiting its admission by emphasizing the phrase 'in wording' defendant reserves the right to urge any different construction or interpretation to be placed on the claims by reason of the reissue thereof and the representations made to the Patent Office to secure such reissue, or otherwise."

Defendant says it cannot further elaborate on this matter until after plaintiff has established its prima facie case (Ans. to Int. No. 1).

2. Defendant does not admit infringement of any claim in suit even if such claim is held valid (Ans. to Int. No. 4).

3. Defendant admits that a conference was had in defendant's offices at 310 So. Michigan Ave., Chicago, Illinois, on March 27th, 1953, attended by representatives of plaintiff and defendant, for a general discussion of the respective positions of the parties by reason of business relationships, patent situations, etc. At such conference

plaintiff provided defendant with true copies of the drawings in the Roth application resulting in patent 2,633,727, together with true copies of the claims that subsequently appeared in the patent when it issued on April 7th, 1953, and with a written statement showing the serial number, filing date, allowance date, payment of final fee, issuing date, and the number and date of such patent. Defendant further admits that at such conference counsel for plaintiff stated to defendant that defendant's structure, as exemplified by Defendant's Exhibit "2" would infringe the Roth patent 2,633,727 when such patent issued about ten days thereafter (Ans. to Int. No. 7 (a-b-c)).

4. Subsequent to issue of the Roth patent 2,633,727 on April 7th, 1953, no formal notice of infringement thereof was served on defendant by plaintiff, but defendant admits that by May 18th, 1953, defendant had completed its investigation of such Roth patent and on such date advised plaintiff by letter that defendant did not consider that it was infringing any valid claim of the Roth patent and was not interested in acquiring a license thereunder (Ans. to Int. No. 7 (d-e)).

5. On or about June 26th, 1952, counsel for defendant did show to counsel for plaintiff a drawing disclosing substantially identical structure to that disclosed in Defendant's Exhibit "2C" (Ans. to Int. No. 7 (f)).

6. At various conferences in 1952 and 1953 plaintiff indicated a willingness to grant a license to defendant, under any one or more of plaintiff's patents, and on terms at least as favorable to plaintiff as those of existing licenses to other licensees of which plaintiff named three companies as represented to be licensees. Other than indicate suggested royalty rates depending on the number of features

licensed, plaintiff did not disclose the terms of the other licenses or give defendant any opportunity to verify whether the suggested rates were those in existing licenses (Ans. to Int. No. 8 (a-b)).

7. Reserving the right to assert other reasons for non-infringement defendant contended that its original production structure, as represented by Defendant's Exhibit "1", did not infringe claim 4 of Patent 2,470,140 for the reasons, among others, that the claim called for "said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap," and furthermore that other limitations in the claim were indefinite in view of plaintiff's own disclosure which was improperly claimed as "imperforate upwardly flared side walls" and also specifying that discharge of the fluid content of the tub * * * (was) "outwardly over its upper edge" * * * "and along and over the top wall" (Ans. to Int. No. 12).

8. The alléged public use by defendant asserted in Par. 18(d) of defendant's Answer occurred subsequent to December 21st, 1945, but more than one year prior to the filing date (December 8th, 1952) for the Reissue Patent 23,626. Another alleged use, under investigation, is by Frigidaire (General Motors), prior to 1942. As latter investigation proceeds plaintiff will be informed of names of Frigidaire users. Defendant's first sale to be relied upon was made on March 9th, 1951. First Frigidaire public use to be relied on was in 1941, but no specimen thereof has been located (Ans. to Int. No. 13(a-e)).

9. Defendant's First Construction, insofar as the tub, sediment trap, and discharge tube arrangement, was not made or sold by defendant prior to December 21st, 1945, the filing date for patent 2,470,140. Nor was defendant's

commercial construction made or sold prior to May 17th, 1949, issuing date for patent 2,470,140. Defendant's first sale was March 9th, 1951 (Ans. to Int. No. 14 (a-b-c)).

10. Defendant's First Construction was designed at Herrin, Illinois, on or about August 12th, 1950, by

(a) Andrew H. Gerhardt, Chief Engineer, Norge Division, 408 So. 12th Street, Herrin, and

(b) Edward Frey, Engineer, c/o Frigidaire Division General Motors Corporation, Dayton, Ohio.

(Ans. to Int. No. 14 (d)).

11. Defendant's Second Construction, as exemplified by Defendant's Exhibit "2", completely superseded the First Construction by first tub made May 12th, 1952, directives to effect transition being thereafter issued on June 9th, 1952 (Ans. to Int. No. 14 (e-f)).

12. Defendant is not informed as to any difference in efficiency as between the two types of sediment trap constructions, and adopted the second design for the reason given in the second paragraph of letter of June 1st, 1953, from Borg-Warner to Andrew E. Carlsen, reading

> "When this situation was first brought to the attention of Borg-Warner, the patent in question was No. 2,470,140 (later reissued as reissue No. 23,626). We checked this patent against our structure and concluded that there was no infringement. However, because of the business relationships, and the fact that Beam was harassed by its licensees, we decided that rather than have an argument with Beam on the question of infringement (and without checking the real scope and validity of the patent) we would change our structure primarily to give Beam an 'out' with its licensees."

(Per Ans. to Int. No. 14 (g-h-i)).

13. Defendant's Second Construction was not made or operated by defendant prior to April 29th, 1952, the filing date for Roth patent 2,633,727, and does not intend to claim priority (as to claims 1 and 3) by development or activities of its employees (Ans. to Int. No. 14 (j-k)).

14. Defendant's Second Construction was designed by Andrew H. Gerhardt, Chief Engineer, Norge Division, 408 South 12th Street, Herrin, Illinois. Gerhardt and Lyle R. Ardis, Plant Manager of Herrin plant, have best knowledge among defendant's employees of structures and manufacturing procedures, etc. (Ans. to Int. No. 14(1) and 15).

15. Of the eight patents listed in Schedules A, B and C, of defendant's Answer, the only structure therein disclosed (other than Castner 2,470,140) ever to be made and sold commercially in the United States, as far as defendant is informed, was a washing machine "substantially" like that in Dyer 2,331,897 which was "manufactured in commercial quantities by the Frigidaire Division of General Motors Corporation in 1941" (Ans. to Int. Nos. 16-17).

IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

* * * * *

TRANSCRIPT OF PROCEEDINGS

72 Mr. Carlsen: There are a number of formal matters that have been stipulated to that I would like to take care of before we call any witnesses.

One is with reference to some exhibits filed by the defendant before the answer was filed in this case. A motion for a more definite statement as to what claims we were going to rely on, and so on, was filed by the defendant; and together with that motion there was a set of drawings

that were identified as Defendant's Exhibits 1, 1-A, 1-B, 1-C, 1-D and 2, 2-A, 2-B, 2-C and 2-D. Those were submitted by the defendant in order that we could determine what their working drawings were on the so-called first and second designs of the accused machines.

Now, in order to dispose of that matter more simply, we filed a stipulation on October 1, 1953, and I would like to offer that stipulation in evidence together with the
73 drawings that were filed by the defendant with that stipulation.

Is that agreeable to you, Mr. Ooms?

Mr. Ooms: Yes. We have no objection, your Honor.

Mr. Carlsen: I might only mention in that connection that the drawings we were furnished copies of and the drawings that were filed with the clerk are mutilated in that certain data was omitted from those drawings. We were then provided with a second set of those drawings which were unmutilated, and we reserve the right to substitute them if there should be occasion to do that. We do not propose to substitute the drawings with the information they have on them at least at this time; but we will reserve the right to do that later on should there be occasion.

There was a set of interrogatories that was propounded by the plaintiff to the defendant that was filed on December 9, 1953, and the defendant's answers to certain of said interrogatories were filed on January 26, 1954. To facilitate consideration of these interrogatories, I have prepared an abstract or resume in narrative form, which I will either read into the record or your Honor can have. Mr. Ooms has agreed that they accurately narrate the an-
74 swered subject matter.

Mr. Ooms: We so agree, and are agreeable to their going into the record.

The Court: All right, they may be received.

Mr. Carlsen: Do you care to have this abstract read?

The Court: No, I don't think so. I think you can put that in your brief.

Mr. Carlsen: All right, sir.

Now, I wish next to offer in evidence a number of stipulations that have already been filed, with one possible exception and that is a stipulation regarding some photographs that were last in the hands of defendant's counsel who has just handed me a signed copy of that stipulation, but I will put it in in its order.

The first stipulation is one dated October 1, 1953. That is the one I referred to, that I first referred to, and the only reason for referring to it again is that it has attached to it two drawings which are identified as Plaintiff's Exhibits 1 and 2. These drawings, your Honor, have been prepared as a substitute for the rather complicated shop drawings that the defendant submitted. We have taken sepa-
75 rate copies of these drawings to use for exhibit purposes so we don't have to remove the others from the stipulation. Mr. Ooms says he agrees that this drawing marked Plaintiff's Exhibit 1 is the drawing that represents the defendant's first form of the accused device.

(Plaintiff's Exhibit 1 was received in evidence.)

Mr. Carlsen: The drawing which is identified as Plaintiff's Exhibit 2 is submitted as representing the defendant's second form or design of the machine, and is a duplicate of that attached to the stipulation.

Do you agree, Mr. Ooms?

Mr. Ooms: Yes, no objection.

(Plaintiff's Exhibit 2 was received in evidence.)

Mr. Carlsen: I next refer to the stipulation dated April 22, 1955, identified as a supplemental stipulation, in which

we have agreed that two additional drawings, marked Plaintiff's Exhibits 3 and 4, represent further illustrations of the defendant's first and second forms of the machine. They, too, are duplicates of drawings that have been stipulated.

Mr. Ooms: Defendant has no objection.

76 (Plaintiff's Exhibits 3 and 4 were received in evidence.)

Mr. Carlsen: I next offer in evidence copies of the three patents in suit as Plaintiff's Exhibits 5, 6 and 7, Exhibit 5 being the Castner patent 2,470,140; Exhibit 6, the reissue patent No. 23,626; and Exhibit 7, the Roth patent No. 2,633,727.

Mr. Ooms: No objection, your Honor.

The Court: I have those here that you handed up this morning.

Mr. Carlsen: Yes. I just thought you would like to use those for working copies, and we will put these formally in evidence.

(Plaintiff's Exhibits 5, 6 and 7 were received in evidence.)

Mr. Carlsen: I next offer in evidence as Plaintiff's Exhibits 8, 9 and 10 certified photostatic records of the file wrappers and contents of the three patents in suit.

Mr. Ooms: No objection.

The Court: They may be received.

(Plaintiff's Exhibits 8, 9 and 10 were received in evidence.)

Mr. Carlsen: My attention is called to the fact

77 that I may not have given the exhibit number of each of the file wrappers, and to straighten that out on the record, I will note that patent No. 2,470,140 is Plaintiff's Exhibit 8; the reissue patent 23,626 being Plain-

tiff's Exhibit 9; and the Roth patent, No. 2,633,727 is Plaintiff's Exhibit 10.

I next offer in evidence as Plaintiff's Exhibit 11, a pamphlet containing copies of all of the patents cited during the prosecution of the three applications for patents in suit. I do this for the obvious purpose that the Court may and we may properly compare the newly cited art with the art that was before the examiner. There is some duplication between the references cited by the examiner in the three cases and for that reason I have only included one copy of each patent but have noted on the cover of the pamphlet to which file wrapper it belongs, so they can be intelligently followed. That is offered as Plaintiff's Exhibit No. 11. I hand a copy to the defendant.

(Plaintiff's Exhibit 11 was received in evidence.)

Mr. Carlsen: The next stipulation is one dated
78 June 23, 1955, which, in addition to covering other matters, includes two drawings that represent respectively the first and second designs of the commercial type of tub made and sold by the Beam Manufacturing Company. That referred to as the Beam first design is offered in evidence as Plaintiff's Exhibit No. 12.

The stipulated drawing which refers to the Beam second design is offered in evidence as Plaintiff's Exhibit No. 13.

Mr. Ooms: No objection.

(Plaintiff's Exhibits 12 and 13 were received in evidence.)

Mr. Carlsen: I might point out, your Honor, that these stipulations with reference to the first and second accused design and the first and second Beam design also agree on the periods of time over which these respective machines were made and sold, so that we can coordinate that with the evidence as we go along.

The Court: You did not have any objection to Exhibit 11, did you, Mr. Ooms?

Mr. Ooms: No, your Honor, I have no objection to any exhibit introduced thus far.

Mr. Carlsen: I will next offer in evidence the
79 physical exhibits which I referred to this morning, and which the defendant's counsel has agreed to in a stipulation dated March 22, 1956, in which photographs of these various exhibits are attached to the stipulation. Possibly the reporter would like to assign the tags that have already been numbered on these physical exhibits.

The Court: Suppose you do it, or have one of your associates do it?

Mr. Carlsen: They have already been numbered.

The Court: It is not necessary for the reporter to do it.

Mr. Carlsen: And those exhibits are all offered in evidence.

Mr. Ooms: Plaintiff's Exhibits 14 to 19, inclusive? Or are you going to read a list?

Mr. Carlsen: Plaintiff's Exhibit 14 is the first design of the Beam tub.

The Court: That is the physical object?

Mr. Carlsen: That is the physical object, yes, sir.

Plaintiff's Exhibit 14-A is merely the agitator that was used in the demonstration.

Plaintiff's Exhibit 15 is the base member, separate
80 and of a one piece construction so that the form of the sediment trap can be observed.

Plaintiff's Exhibit 16 is substantially the same, only it is a two-piece construction.

Plaintiff's Exhibit 17 represents or is one of the second forms of the Beam designs.

Plaintiff's Exhibit 18 is the first Norge design.

Plaintiff's Exhibit 18-A is the Norge agitator which can be used in either of the Norge machines.

Plaintiff's Exhibit 19 is the cut-away section of the second Norge machine.

Mr. Ooms: No objection to any of those, your Honor.

The Court: They may be received.

(Plaintiff's Exhibits 14, 15, 16, 17, 18 and 19 were received in evidence.)

Mr. Carlsen: Now, when we took the deposition of Mr. Castner in Florida last week, in order that he could properly testify about these various machines, we had pictures taken of the various physical exhibits, and they are referred to in the stipulation as Plaintiff's Exhibits 14-PH-1 to 14-PH-5, inclusive, the "PH" merely indicating that it is a
81 photograph. I will offer copies of those photographs in evidence under that stipulation.

Mr. Ooms: No objection.

The Court: They may be received.

(Plaintiff's Exhibits 14-PH-1, 14-PH-2, 14-PH-3, 14-PH-4 and 14-PH-5 were received in evidence.)

Mr. Carlsen: There is one additional stipulation, dated August 10, 1955, that goes into some formal matters that we have agreed upon, and I offer that stipulation in evidence also.

82 Mr. Carlsen: I will now call to the stand Mr. William P. Berghuis.

WILLIAM P. BERGHUIS, called as a witness on the part of the plaintiff, being first duly sworn, testified as follows:

The Court: What is your name?

The Witness: William P. Berghuis. My home address is 4609 Browndale Avenue, Minneapolis 24, Minnesota.

The Court: What is your business or profession?

The Witness: I am vice president, secretary, and general counsel for Gamble-Skogmo, Inc.

The Court: They merged with Solar?

Mr. Carlsen: Yes.

The Court: Go ahead.

Direct Examination by Mr. Carlsen.

Q. How long have you been employed by the Gamble-Skogmo organization?

A. On a full time basis as general counsel since January 1, 1946.

Q. Were you employed prior to that time?

83 A. Prior to that time I was associated with the law firm that did the law work for Gamble-Skogmo, Inc., from 1925 on, but then I was in private practice during those years.

Q. Did you represent the Gamble-Skogmo company when it was incorporated?

A. Yes, our firm represented them continuously from that time on.

Q. What is the nature of the Gamble-Skogmo business?

A. Gamble-Skogmo, Inc., was incorporated in 1928, at which time it took over 55 retail stores, and it has added to those and now operates a chain of stores, approximately 300 units that the company owns, and then it sells merchandise at wholesale to approximately 1800 dealers who operate under the name of Gamble Authorized Dealer Stores.

Q. What is the general type of merchandise?

A. We sell a wide line of appliances, radio, TV, washing machines, batteries for cars, tires, household goods, fur-

niture, and merchandise of that general nature; many hardware items.

Q. Where is this merchandise obtained from?

A. Mostly from manufacturers that we buy from, although the company over the years has bought the
84 washing machines from the Beam Manufacturing plant originally, which later became a part of Solar. And the company until December 31, 1955, also had its own three factories for the manufacture of automobile storage batteries, automobile batteries, and for many years the company has had and still has a paint and varnish factory at Cudahy, Wisconsin.

Q. Did you have anything to do with the corporate organization of the Beam and Solar companies at the time that they were incorporated?

A. Yes. My firm handled all of those matters and I personally was one of the incorporators of the Beam Manufacturing Company when it was incorporated.

Q. Will you please just briefly outline the pertinent facts in connection with the corporate origins, existence and present status of Gamble-Skogmo, Solar, and Beam corporations, giving such dates as may be of interest in this case? You may refer to any memorandum you may have to shorten this up.

* * * * *

85 A. Gamble-Skogmo, Inc., was incorporated in Delaware in May of 1928, and it has always been incorporated under the same name, and at different times there have been amendments to increase capital, and so forth, but it is the same identical corporation.

Solar Corporation was incorporated in Delaware in July of 1929. Solar Corporation became a wholly owned subsidiary of Gamble-Skogmo, Inc., on November 1 of 1946.

On June 6 of 1955 Solar Corporation was merged into Gamble-Skogmo, Inc.

Now, the original Beam Manufacturing Company,
86 of which I was one of the incorporators, was incorporated in Iowa on March 2 of 1937; and it, that is Beam Manufacturing Company, was merged into Solar Corporation on December 9, 1942; and from that date on the washing machine factory at Webster City, Iowa, continued operating as Beam Manufacturing Company Division of Solar Corporation.

By Mr. Carlsen:

Q. What is the present status of the present Beam Manufacturing Company at Webster City? That is a second Beam corporation, is it not?

A. The washing machine plants at Webster City, Iowa, previously operated by Beam, and after its merger then Solar Corporation, and then as I have said Solar was merged into Gamble-Skogmo, Inc.; and on July 1 of 1955, that washing machine factory was sold to Franklin Manufacturing Company, a Minnesota corporation, which is the parent, but to operate the business they created two new corporations in Iowa, one by the name of the Beam Manufacturing Company, a new Iowa corporation, to operate the washing machine business, and another one by the name of Beam Company to hold certain fixed assets.

Q. The present Beam Manufacturing Company has a license, is that correct, under these various Castner
87 patents?

A. That is right. It is in effect a license agreement under which they are licensed, as these other licensees are, to use these patents in question.

Q. Are they paying royalties regularly?

A. They are.

Q. Are you familiar with the previous license agreements that were given to people such as Hotpoint and Speed Queen and Easy?

A. As the secretary of the corporation, I have those in my file.

Mr. Carlsen: At this time, your Honor, I wish to offer in evidence what has been stipulated we may offer in evidence without further authentication, the license agreements involving the patents here in suit. I would like to identify them by new exhibit numbers that we will have to give them starting with Plaintiff's Exhibit 40.

Mr. Ooms or defendant's counsel have received copies of these various license agreements; considerable testimony has been given in connection with them; and while
88 I do not believe it necessary to offer all of them, I will offer as Plaintiff's Exhibit 40 the license agreement from Solar Corporation to Hotpoint, Inc., dated July 14, 1948;

A revision letter of November 28, 1950, somewhat modifying the original Hotpoint agreement, as Plaintiff's Exhibit 41;

And as Exhibit 42 I will offer in evidence the Solar Corporation license agreement to the Speed Queen Corporation, dated November 30, 1951;

As Plaintiff's Exhibit 43 I offer in evidence Solar agreement of November 27, 1952, giving a license to the Easy Washing Machine Company;

And as Plaintiff's Exhibit 44 an agreement entitled "Technical Assistance Agreement," dated October 27, 1952, between Solar Corporation and Easy Washing Machine Company.

There are some other agreements that have been agreed upon to the Dexter people, but I see no point in offering them in evidence, at least at this time.

Do you have any objection?

89 Mr. Ooms: I have no objection to those offers, your Honor.

The Court: All right.

(Plaintiff's Exhibits 40, 41, 42, 43 and 44 were received in evidence.)

Mr. Carlsen: These have not been numbered. I assume they can be taken care of later on.

The Court: That is right.

By Mr. Carlsen:

Q. Mr. Berghuis, do you know if there are any other license agreements involving patents outstanding as between any of your companies and Easy, Speed Queen or Hotpoint other than the license agreements I have just referred to?

A. There are none other than that.

Q. And have these three companies been paying their royalties regularly under these agreements?

A. They have.

Q. To whom have those royalties been reported?

A. Prior to July 1st of 1955, three of those companies sent their royalty checks to the Beam Manufacturing Company office at Webster City, and one sent checks to the Solar Corporation office in Milwaukee.

90 Subsequent to July 1, 1955, all of those royalty checks have been sent directly to our home office at Minneapolis, Minnesota.

Q. Do you have the accounting or reports on those royalty payments that have been made directly to the Gamble-Skogmo Company?

A. Yes, I have those.

Mr. Carlsen: Now, your Honor, possibly we can shorten this up a little bit. During the course of the taking of the deposition down in Florida, Mr. Ooms raised this question.

While Mr. Castner testified with reference to the amount of royalties that had been received from these various companies over the years since the agreements were signed, he did that from a schedule or a complete sheet that had been prepared by an auditor at their home office. Mr. Ooms objected to the testimony based on that sheet and that schedule inasmuch as, according to him, it was not the best evidence.

We have now obtained not only all of the accounting reports, the original accounting reports that were used
91 in making those overall figures, or arriving at these overall figures; but we are also about to receive, if necessary, through Mr. Berghuis, the additional reports that have come in since the recent merger.

Now, Mr. Ooms, if you can agree on some of this, we can certainly omit all of this bookkeeping and all of these reports.

Mr. Ooms: Your Honor knows I always do that, and my only point was that the witness, who was ill in Florida when we took his deposition, had nothing but some sheets of paper that I never had access to, and I wanted to see the originals to verify them. I think rather than go through the bookkeeping, because I am not questioning the figures—I want to question something on what the royalties were paid for—I think if we can look over the original reports with either Mr. Berghuis or counsel after court, we can readily agree on those figures. I don't think we will have any difficulty about that.

Mr. Carlsen: That being the case, I don't see any point in taking the time to include it all in the record here.
92 The only point is that Mr. Berghuis would like very much to leave Chicago this evening to attend to something else, but he can just leave these with us until we can get together on it.

Mr. Ooms: I think we can.

The Court: Well, you have indicated you have the bookkeeping accounts. If the books are offered to the other side for inspection or to look at, why, then, the summary may be admitted. I think that takes care of that.

Mr. Carlsen: We have all the books to offer, but I don't like to put them in evidence.

The Court: It isn't necessary. Just so you say they are here and say to counsel, "Here they are."

Mr. Ooms: I will look at them after court, if that is agreeable to your Honor.

The Court: That is all right.

By Mr. Carlsen:

Q. There is only one point then that I would like to have you clear up, Mr. Berghuis, and that is with reference to the amounts of royalties that have been
93 received since Mr. Castner testified about this matter, since the compilation of the figures that he testified about. I think if you can go back for maybe one year it would be adequate.

A. As I said, the royalty checks that were paid subsequent to July 1, 1955, all came to our home office at Minneapolis, Minnesota. The first few, in fact, came to me for my personal attention, but I requested that they be sent after that to the vice-president for finance, where they would be processed anyway. Those checks, we received them directly after July 1st, 1955, included all royalties for the second quarter of 1955 and since.

Now, do you wish me to read the amounts?

Q. I wish you would, because that we can supplement.

A. The supporting material is right here—the letters of transmittal, our company's records made from the checks we received, and so forth. At my direction R. W. Redney,

the assistant controller, made a summary of this, from which I am now reading.

From Hotpoint:

94 The first check we received from them was on August 4, 1955, covering the period 4-1-55 to 6-30-55, in the amount of $26,147.71.

The next check received from them was on October 28, 1955, for the third quarter of that year, beginning 7-1-55, and ending 9-20-55; amount $21,742.31.

* * * * *

95 A. (continuing) Still on Hotpoint:

The last check we received from them was on February 6, 1956, covering the last quarter of 1955, and the amount of the check was $26,094.25.

At the time I left home we had not yet received the check from them for the first quarter of 1956.

The next figures will be as to Easy Washing Machine Corporation:

The first check received was on August 4, 1955, covering the second quarter of 1952; the amount, $19,020.90.

The next check was received on October 10, 1955, covering the third quarter, in the amount of $10,675.77, and then we received an additional check from them on October 31, 1955, also for the month of September, covering the period 9-1-55 to 9-30-55, in the amount of $7,451.26.

I think I said the earlier check was for three months.

96 It was for two months. They sent us two checks, the first of which covered July and August, and the last mentioned check covered the month of September.

Then on January 30, 1956, we received from Easy Washing Machine Corporation a check for the last calendar quarter of 1955, in the amount of $16,320.99.

There, again, we had not received remittance for the first quarter of 1956 when I left home.

The Speed Queen Corporation figures will come next: The first check received from them in Minneapolis was on July 22, 1955, covering the second quarter of that year, in the amount of $13,507.85.

The next check was on October 27, 1955, covering the third quarter of that year; amount, $17,776.75.

The next check was on January 30, 1956, being for the last quarter of 1955, in the amount of $19,007.23.

On April 19, 1956, we received from them a check for for the first quarter of 1956 in the amount of $15,-812.27.

97 The Witness:-Do you wish me to give the figures as to any others here?

Mr. Carlsen: No, I think that will be enough. That is all the direct examination.

Cross Examination by Mr. Ooms.

Q. Mr. Berghuis, you are familiar with the license agreements under which these royalties you have just tabulated have been paid, are you not?

A. Yes, sir, in a general way.

Q. And Plaintiff's Exhibit 43, which has been introduced here, to the Easy company, on October 27, 1952, is quite typical of those licenses, isn't it?

A. Well, they all follow the same general form, these license agreements.

Q. And they all cover the same patents, do they not?

A. Yes, I believe so.

Q. Now, as I understand it, each of these royalty payments that was made to you was made at the highest rate payable under the license agreements such as Plaintiff's Exhibit 43?

A. That I am not sure of. There may be one of these that is at a reduced rate. I will check into that.

98 Q. You are familiar with the fact that these licenses provide for a high rate of royalty and a low rate of royalty?

A. That is right.

Q. And the high rate of royalty is payable if the manufacturer who is licensed uses two or more of the patented devices which are licensed?

A. That is right.

Q. That is correct, is it not?

A. Yes.

Q. Have you made any determination as to what of the patented devices licensed under these agreements the royalties you have referred to this afternoon were paid for?

A. No, I am not in a position to give you that information.

Q. Who could tell us that in the Gamble-Skogmo organization?

A. Well, I can't tell you whether anyone in our Washing Machine Division would know that or not. Personally I do not know which of these patents one or more of these companies are using.

Q. You don't know what they paid the royalties then for?

99 A. I know they are paying royalties pursuant to the license agreements, but I am not familiar with their product, and I don't know which of the patents they are actually employing.

Q. You are not technically familiar with the features of these machines, called, respectively, the snubbers and the fluid drive?

A. No.

Mr. Ooms: That is all, Mr. Berghuis.

(Witness excused.)

* * * * *

104 Deposition of George P. Castner, taken at Orlando, Florida, on the 16th, 17th and 18th of April, 1956.

"MR. GEORGE P. CASTNER, being first duly sworn, as a witness produced on behalf of the plaintiff:

Direct Examination.

Q1. Will you please state your full name and age and residence?

A. George P. Castner, 227 Rippling Lane, Winter Park, Florida.

Q2. What is your present occupation, if you have one?

A. I am now retired since July of last year.

Q3. What did you do prior to that time?

A. Prior to that I was general manager of the Beam Manufacturing Division of the Solar Corporation at their plant in Webster City, Iowa."

The Court: How old a man is he?

Mr. Ooms: Sixty. It is not in the record. We are agreed on it.

"Q4. As you know, Mr. Castner, we are taking
105 your deposition here in your home on the advice of your doctor who told us that it would be inadvisable or unwise for you to come to Chicago for the trial. I wonder if, at this point, you wish to confirm this on the record, any statement as to the present condition of your health?

A. Well, one thing that was very instrumental in my retiring was the fact that I had not been feeling well. I had cataracts in my eyes and they were operated on. I had trouble with a hip and in general, did not feel good and since coming down here I ran into another condition that I did not know prevailed at that time which involved a malignant condition and through which I have been—on

account of which I have been subjected to surgery here. That was an unusual operation involving the use of radiotrons of gold, I guess they called it. Atomic energy. Which has, I guess, an effect on your system that it's quite a shock and it takes you quite a while to get over. So that while I am making progress, why, I still don't have the stamina.

Q5. Are you still taking those treatments?

A. Yes, I have been reporting to the clinic weekly.

106 Q6. Well, then, in deference to your health and your comfort, Mr. Castner, I wish you would advise us if you tire or are weary from this examination and if you do, we will take whatever recesses are necessary.

A. All right, sir.

Q7. Do you still have any official position with reference to Gamble Skogmo, the present plaintiff in this case?

A. Yes, I am still the vice president.

Q8. And are you, or were you, in any way active with the more recent Beam Manufacturing Company? That is, the Beam Manufacturing Company that was incorporated quite recently?

A. Yes, I was chairman of an advisory committee with the intention to stay with them until the integration of the two companies were completed. See, that involved this new company purchasing the old company so it really meant new management and there were some restless situations and so on so I stayed in there for a period of time.

Q9. Now, you of course are the same George Castner that obtained the two patents, Castner patents here in suit?

107 A. Yes, sir.

Q10. You are the same Mr. Castner who previously gave depositions in this case on call by the defendant, are you not?

A. Yes, sir.

Q11. Are you fairly familiar with the patents in suit, Mr. Castner?

A. Yes, sir.

Q12. Including the Roth Patent?

A. Yes, sir.

Q13. How long have you known Mr. Roth, and will you tell us a little about his connections with the Beam Company while you were there?

A. I have known Mr. Roth, I think since the early part of 1951, at which time he was employed as an engineer with the Appliance Manufacturing Company of Alliance, Ohio, which company was a division of the Dexter Company of Fairfield, Iowa.

In the latter part of 1951, I hired him and he went to work for the Beam Company as of the first of January, 1952.

Q14. And in what capacity was he employed by the company?

A. As a chief engineer of the Product Engineer-
108 ing Section.

Q15. Is Mr. Roth still with the present Beam Manufacturing Company?

A. Yes, sir.

Q16. I believe you stated that you were general manager of the Webster City Plant from its inception. When was that?

A. Well, that was incorporated in March, 1937, and I was with it from the very start.

Q17. You were with it up until the time of your retirement last year?

A. That's correct. A long time with the title as general manager of the factory.

Q18. Who has succeeded you as the general manager of the plant?

A. Harold Leisey, whom I hired approximately eight years prior to my retirement.

Q19. What was the main item of production with the Beam Company from the time it was organized in 1937 and as long as you were with it, Mr. Castner?

A. The main product was washing machines, domestic type, as used in the homes. We also got into other products, though, such as, during World War II, when washer
109 production was completely shut off for a period of time, I think from May 1, 1942, until some time in the latter part of 1945, and during that period we were not permitted to make any washing machines except a few that we made for the government. Otherwise, our entire effort was in behalf of the government for war production items.

Q20. Except for that period, however, all of your production was washing machines from 1937 up to the present time. Is that correct?

A. There was another item that we produced for about two years and that was a motor scooter immediately after the war, primarily because we could get materials for that and we couldn't get enough materials for washing machines. But that was more of a stop-gap than anything.

Q21. During the 17 or 18-year period that you were with the company, would you explain a little more in detail just what your duties and responsibilities were?

A. Well, my duties comprised about everything that went with the operation of the factory and a great deal of
110 it had to do with the development of the product to begin with and also the organization and management of equipment, supervision of personnel,

supervision of the organizing of the accounting, and the financial arrangements and all phases that normally go with the complete operation of the plant.

Q22. Will you go back and, to the exent that you can recall, will you explain something of your early efforts in the development of washing machines when you first went to Webster City?

A. Well, our first efforts were directed towards the conventional washers of the wringer type and in developing that we secured machines of all different makes and made tests as to washability and mechanical construction and investigated what we could on patent structures and so forth so that we were clean as far as patents were concerned. We did take on a transmission that was a patented design and we took out a license on that transmission which, at the time, was under the ownership of a man by the name of Patch, and we built our machines incorporating that device. Other features were pretty much standard in the machine.

Q23. You didn't then immediately get into pro-
111 duction of automatic washers?

A. No. No, they were not in very general use at that time. In fact, there was, the first ones were just appearing on the market, mainly the Bendix and our main object as to get a design, a conventional wringer-agitator machine that would be a good quality product and at low cost. All of our efforts were directed primarily in that direction.

Q24. You have used 'we' on several occasions. Are we to understand that you are speaking now in terms of the management in Minneapolis of the Gamble-Skogmo people?

A. Well, all my efforts, of course, were generally in ac-

cord with the overall policy of those that had the main financial interest in it but I was the one that pretty much carried the load because they knew very little about the manufacturing processes and the problems involved in developing a design as well as setting up the manufacturing facilities for it.

Q25. But, am I correct in understanding that the Gamble-Skogmo people were interested in having you build a washer, a conventional washer, first?

112 A. That's correct.

Q26. To supply their outlets?

A. That was the prime object. But in the background, why, I had in mind to build up the company, go out and get outside business.

Q27. Well, in so far as the Gamble-Skogmo organization is concerned, would you tell the Court just a little bit about what its business consisted of? And why it wanted washing machines?

A. Well, originally they were a series of retail stores covering automobile accessories primarily. Then they got into appliances and branched out into other types of merchandise but they were having difficulty in establishing a satisfactory source of supply. They were buying some from the Blackstone Company in Jamestown, New York, but they weren't able to get the right quality and at competitive prices, and it was for those reasons that they were primarily interested in establishing a source of supply to take care of their requirements.

Q28. Well, what I wanted to get into the record,

113 Mr. Casner, was something of the nature of the Gamble business, the number of stores and what type of organization it is and was.

A. Well, they had a series of their own stores. They

called them branch stores. They owned them outright. And there were at that time something like 350 stores of their own. In addition to that, they had a merchandising program where they sold that special merchandise that they developed for their own stores to other franchise dealers which they called associate stores and they had somewhere in the neighborhood of 1800 or 2,000 of those associate dealers and approximately forty to fifty per cent of their overall volume was done on more or less of a wholesale basis through those independent associate dealers.

Q29. All these stores were known as Gamble stores, were they not?

A. That's correct. They carried the Gamble name but the dealers, or the franchise dealers, were ordinarily labeled associate dealers.

Q30. As far as the general public was concerned, they only recognized them as Gamble stores. Isn't that correct?

A. That's correct.

114 Q31. When did you first start thinking in terms of developing an automatic washing machine?

A. As I mentioned, the first ones were appearing on the market just prior to World War II and the success of those was questioned by a lot of people but they had attained some stature and most of the companies were of the opinion that after the war there would be considerable activity in automatic washers. That was borne out by surveys of the Saturday Evening Post and similar organizations. So we felt that we should be prepared shortly after the war to have an automatic washer. We crystallized that thinking along in 1944 and put the project in the hands of a couple of development engineers up in Minneapolis by the name of Arthur Lund and Roland Knapp.

Q32. What, if anything, did they do towards the development of an automatic washer?

A. Well, they developed, I think, about three different types of machines from some of which they obtained patents.

The main one that they concentrated on was one that had an up-and-down action and that turned out, however, as well as the others, that they were not practical production machines. They had shortcomings in their inability to handle satisfactory loads and do a good job of washing, or the electrical load was way too heavy and the cost would be out of line to meet what was anticipated in a competitive way, so that they were all finally abandoned.

115

Q33. Then what did you do towards the development of a machine of the automatic type?

A. Well, first, we explored to see what we could obtain on the market that was developed and we tried two or three different places there, such as with Apex Electric, and didn't get any place there. We also fooled with a machine that was developed by the Admiral Company but none of those approaches developed into anything favorable to us. It was then that I approached the problem. We had had a chance to analyze it from several angles due to the work that we had done through these two men in Minneapolis as well as these other contacts and I felt that I had a pretty good idea of what would be required for a successful, practical production machine.

Q34. Did you at that time have any particular or specific problems in mind in connection with the development of an automatic washer?

116

A. Well, the main, or the principal, machines that were on the market in any volume were the cylinder type which

I felt did not do as good a job of washing as the oscillating, agitator type, such as the washing action in practically all of the conventional wringer type machines that had been on the market up to that time. So I felt that it should be the oscillating agitator type.

Q35. I don't want to interrupt you, but was that the type of washing action you had been using in your conventional washer prior to that time?

A. Yes. As I analyzed it, there were three basic problems in such a machine that I envisioned. One was the cushioning of the electrical load particularly during the spinning cycle required for extracting the water from the clothes. To handle that problem I worked out a fluid drive and hydraulic clutch which was incorporated into the transmission line and it cushioned the electrical load like I mentioned.

Another basic problem was the type of tub that
117 would be used. What oscillating agitator automatics had appeared on the market had mostly a perforated wash tub with a liquid-holding tub around it. This perforated tub did get rid of the heavy soil because it sifted down into the liquid-holding tub and was flushed out when the water was drained off but it had the serious disadvantage because in that area behind the wall of this perforated tub, scum and soils accumulated and it would contaminate the new water that was put in each time because it was inaccessible to clean out behind it. It also had the disadvantage of requiring more hot water and, consequently, soap, because of that area between the perforated tub and the solid liquid-holding tub. A certain amount of space was required for the vibration during the spinning and that is why that space had to be fairly good ; J resulted in that substantial use of extra water and soap. The solid tub, I felt, therefore,

was the best. But I had a basic problem then of disposing of the heavy soil that would have to be accounted for.

Q36. Before we get into that, Mr. Castner, and just so we have this matter clear on the perforated type of
118 tub, will you explain a little more in detail how the so-called perforated and solid tubs are arranged with respect to each other? That may not be clear from what you have said so far. Is the perforated tub inside the solid tub?

A. That's correct.

Q37. And of smaller size?

A. Of a smaller size and ordinarily there would be a space of anywhere from a half inch to an inch or more between the perforated tub and that liquid-holding tub all around the circumference as well as at the bottom.

Q38. And is that the space you referred to that was increasing the amount of water required?

A. Yes, sir.

Q39. And soap?

A. Yes, sir.

Q40. And I would assume that would also increase the cost over the cost of a single tub arrangement?

A. That's right. Because normally, a splash tub around could be cheaper than the other liquid-holding tub.

I built up several tub structures with the oscillating
119 agitator in them and through extensive experimenting I found that a dished-shaped tub with the oscillating agitator action would bring that heavy soil to the center of the tub under the agitator.

Q41. Excuse me, Mr. Castner, but just so we don't have to go back to this, on a previous occasion I think in your previous deposition, you stated that one of the other problems was a matter of vibration. Would you discuss that a little before you get into the sediment problem?

A. The vibration and mounting of the whole mechanism represented that I considered the third basic problem and that required a mounting that would give you that cushioning effect and through the use of snubbers and a pivot point where most of the load was carried, we found that you could absorb a good part of that vibration so that it would not be transmitted to the outside cabinet of the washer. So that that represented the third basic problem as I analyzed the project ahead of us.

Q42. Now, of these three problems, which concerned itself most with the actual washing operation and getting the clothes clean?

120 A. Well, of course, of the three, the one that had most to do with the clothes cleaning and all was the disposal of the sediment because if that just accumulated at the bottom of the tub it would be thrown out and become imbedded in the clothes at the time of the spinning or extraction cycle.

As I mentioned before, I found through this experimenting with different tubs, different tub designs, that I could accumulate it towards the center of the tub and under the agitator. The problem then was not to lose that accumulated soil but to dispose of it and, to accomplish that, then I figured that by putting a further recess around the center post portion of the tub, that I could get that soil in there and trap it through means of an overhanging lip but that was not enough, just to trap it. It had to get to the outside. You couldn't have a valve or faucet in there because that was being spun and it was impractical to get electrical or mechanical means to such a valve to shut it off or open it as required, so I then worked on the idea of having a valve that would be actuated through cen-

121 trifugal force that would be held closed by means

of a weight or by spring tension and would be operated when the tub was put into the spinning cycle through the means of centrifugal force.

Q43. Are you referring to valve devices such as shown in Fig. 2 and 3 of your reissue patent No. 23636?

A. Yes, sir.

Q44. Now, Mr. Castner, before we get into more details of the structure here involved, I would like to have you explain (and this may seem elementary to you but it's not so to some of us and possibly to the court), I would like to have you explain some of the fundamental characteristics of what you have referred to as a conventional washer as compared with an automatic washer in the clothes washing field, of course.

A. Well, the conventional washer that comprised at that time, I estimate, at least 95 per cent of all such conventional washers, consisted of a chassis, generally round in shape, and on which was mounted a round tub. There was a motor attached to that with a transmission that gave the proper speed reduction to get the oscillating
122 agitator action at the proper speed and that agitator oscillating back and forth washed the clothes. It was equipped with a power take off from the transmission to drive a wringer shaft and it came up the side of the tub and was connected to a wringer. There was a clutch so that you could engage the agitator and a second clutch so that you could engage or disengage the wringer. To wash then you filled the tub with the water and soap and clothes and engaged the agitator manually and then ordinarily came back to shut the agitator off and then the clothes were lifted manually from the water and fed into the wringer which had been engaged to do the wringing operation. That was all a manual operation although some machines of that

type were equipped with a timer that either rang a bell with it at a certain time so the operator could go back and disengage the agitator, and some of them also shut off the motor at a predetermined time. But otherwise, it was all a manual operation.

Q45. Incidentally, there is no drying operation other than what was accomplished by the wringer in the conventional washer. Is that correct?

A. That's correct. You might add there, too that
123 the water was put in there manually and also drained off manually through a drain cock into the sewer or through means of a separate pump, all of which were operated manually.

As I mentioned, the automatic washer is a much more complicated device and in this one, you would just put in the clothes and the soap.

Q46. By 'this one' what do you mean?

A. The automatic.

Q47. In your particular automatic or any of them?

A. In all automatics.

Q48. All right.

A. In some of them, the water was not controlled. The original water fill was controlled manually. But in most of them it just required a dial setting and the water would come in to fill automatically and everything from that time on would be done automatically including washing by the agitator, the time set in the shutting off of the agitator, the draining off of the water by centrifugal force, or, in the perforated tub type by means of a valve. The fresh water for rinsing would automatically be run into the tub
124 at the proper temperature and to the proper level.

The agitator would be turned on again to give a mechanical rinse after which the water was again auto-

matically drained off and the spinning cycle would complete the wash job and accomplish a spin-drying condition that would be normally equal or better than what was accomplished through the wringer on a conventional machine. The automatic washer would shut itself off when that final drying cycle was completed. So that, other than the original filling, the operator could set the dial and leave the machine and come back in a half an hour or so and the cycle was completed. Or, come back the next day. They never had to attend it.

Q49. Then, there was a timing mechanism and there was a timing mechanism in automatics that automatically takes care of the various cycles of operation?

A. Right through the complete cycle. Yes, sir.

Q50. And in these instances there is no occasion to use a wringer. Is that right?

A. That's right.

125 Q51. I believe you have already answered this but, how does the actual washing operation in the automatic agitator type of machine compare with the washing operation in the agitator conventional type of machine?

A. Well, it's practically identical. In fact, in ours, because we used the agitator interchangeably between our conventional machines and the automatic machines.

Q52. Now, do all automatic machines use the so-called agitator type of washing?

A. No. The biggest majority do. I would say maybe in the neighborhood of 70 per cent of all that are produced use that type of action.

There is another type such as was used in the original Bendix and that is where they tumble the clothes in a cylinder with fins on it and such a cylinder has a horizontal shaft. Whereas, the oscillating agitator type has a vertical shaft.

The tumble type of action is exemplified primarily in the original Bendix machine and the current Westinghouse automatic machine.

Q53. Now, Mr. Castner, I am going let you get back to your original answer, your previous answer, on
126 your problem of dirt and scum and soil disposal and the development of it as it occurred with you at Webster City.

A. As I was describing, I was able to accumulate that heavy soil in a recess in the center of the tub under the agitator, which recess had an overhanging lip. I experimented and gave a lot of study and thought to those two valves that would be actuated by centrifugal force, one by means of a weight that kept it closed and the other by means of a spring tension such as the Fig. 2 and 3 referred to in the reissue patent.

There were some complications there because it would be possible for a bobby pin or some strings or similar objects that would prevent the spring or weights from closing that valve to a watertight condition. I then worked on the idea of one or more tubes that would be connected to a discharge hole from that recessed trap and finally worked around to a tube then that would come up the side of the tub at a slight angle to the vertical, slight outward angle to the vertical. Such a tube came up above the wash-
127 ing level of the tub so that it was impossible for any leakage to develop and it completely eliminated any problems that you would have with a valve structure. Then, as the tub was spun with the wash water and the clothes in there centrifugal force then would cause the water to flow out from that trap through the tube. It would be ejected from that tube then into the splash tub and would go down the drain along with the rest of the water and

would be completely eliminated from any contamination with the clothes. This tub structure that I described with a solid wall did not accumulate the scum and curd that I referred to that happened with the perforated tub and a liquid-holding tub around it. The walls, I found gave better results with a slight taper outward.

Q54. You are speaking now of the walls of the tub itself?

A. Yes, sir. So, where a tub might be approximately 12 inches high, there would be a taper to the extent of a quarter of an inch or so, so that when the tub was spun the water would climb up the sides and go out through the escape holes at the top. I found also through my experi-
128 menting that when the washing cycle was completed and this heavy soil was accumulated at the bottom and there was also the lighter soils with the soap or detergents that would float to the top of the wash water and the load of clothes. When this load went into the spin it would automatically then not only eject the heavy soil from the bottom but, as the speed of the spin picked up, would create a vortex from the surface of the water and cause that lighter suds and scum to generally slide over the top of the clothes so that it did not sift through the clothes such as would happen when they drained through the perforated tub design with the liquid-holding tub around it. This tube provided a separation of the water in that the tube would draw water off the bottom in that trapped recess for a considerable time, until that vortex moved out and the lower diameter of it exceeded the area of that annular trap at the bottom of the tub."

The Court: Gentlemen, we will adjourn until ten o'clock tomorrow morning.

129 (Whereupon an adjournment was taken to 10:00 o'clock a.m. of the following day, April 24, 1956.)

* * * * *

131 Mr. Carlsen: Before we continue with the reading of the deposition, your Honor, in the hope that we can eliminate at least part of the deposition that refers to these royalty figures, I have prepared a tabulation or analysis last evening following the conference I had with Mr. Ooms, and at your suggestion, which I believe is acceptable to Mr. Ooms.

Mr. Ooms: Yes, we accept the figures, your Honor. Of course, that does not prove what they were paid for.

Mr. Carlsen: I only explain that in preparing this tabulation, which, incidentally, comes to within about one per cent accuracy of the other tabulation we had, I have omitted the royalty accountings for the first quarter of this year because they are not all in. I have omitted everything in the way of technical assistance payments. I have omitted the lesser contracts, such as Simpson and Dexter and Philco.

132 So this is merely an annual breakdown of the Hotpoint, Speed Queen and Easy payments, showing the exact number of units which they sold and on which they paid royalties, the total amount of royalties for the respective years; and you may be interested in the grand total which is that for these three companies they have through the year 1955 made a total of 794,291 automatic washing machines, on which they have paid a royalty of $1,002,179.57.

I will offer this tabulation in evidence as Plaintiff's Exhibit 45.

Mr. Ooms: No objection, your Honor.

The Court: It may be received.

(Plaintiff's Exhibit 45 was received in evidence.)

The Court: As I understand, in this deposition there is some reference to that?

Mr. Carlsen: There is considerable testimony that Mr. Castner gave, and when we reach that point I will just omit those questions and answers.

Mr. Ooms: Yes. I assume that the whole deposition will go in, nevertheless, for such use as we may
133 want to make of it in the brief, but I certainly agree that counsel can skip a great deal of the reading both of the direct and cross.

The Court: All right.

134 GEORGE P. CASTNER DEPOSITION (ctd.)

Direct Examination (ctd.).

Mr. Carlsen: Completing the answer to Question No. 54 that we did not complete yesterday:

"So I was accomplishing several things that would help to do a more efficient job of washing by disposing of the scum as I have described it and disposing of the heavy soil through the bottom of the tub.

Q55. You referred to what happened to the surface of the water. I assume you mean in the tub?

A. That's right.

Q56. Now, in that it forms a vortex. Now, that may or may not be the correct term, I do not know, but, isn't it true that forms a sort of an inverted cone, the surface of the water in the tub?

A. When I referred to a vortex, I was referring specifically to such an inverted cone shape.

Q57. That's right. So that the water, as it is affected by centrifugal force, moves out against the wall of the tub?

135 A. That's right.

Q58. Some of it goes through the holes, does it not?

A. That's correct.

Q59. And that water will sort of climb up the wall of the tub because of its flared shape that you spoke of?

A. That's right. And that water that goes out through the clothes and climbs up the side wall is not so objectionable to doing a good cleaning job because, through the means I have described, we have removed heavy soil from the bottom and we have more or less slid the lighter soil that's floating on the suds off over the top so that that residual water then is ordinarily not so objectionable.

Q60. Then that same operation is repeated during the rinsing cycle. Is that correct?

A. That's correct.

Q61. And prior to the rinsing cycle, are the clothes again agitated by the agitator as they were in the original washing cycle?

A. Yes. During that rinse (we call that a power
136 rinse because it's clear water that's been run in), and with the agitator working, it gives a mechanical agitation of the clothes that is vastly superior to the old dunking up and down that the housewife used to give them in the rinse tub with the so-called conventional washer with a wringer.

Q62. Do some of these automatic machines, or the Beam in particular, the one that you make, have more than one rinsing cycle?

A. Yes. We have at least three different stages to the rinse in that we flow in clear water to the point that it overflows while the agitator is running and then after the water is shut off we ordinarily continue to agitate for approxi-

mately a minute and then after the tub automatically goes into the spin for the extraction we normally put in two or three spray rinses then of clear water that sifts through the clothes and does a final cleaning function there due to the centrifugal force and the clear water goes through the clothes.

Q63. When did the Beam Company first go into production on an automatic washing machine involving the sediment trap feature and the sediment disposal feature that you have referred to?

137 A. It was in the early part of 1947.

Q64. Was it on the first automatic machines you made?

A. Yes. The first design. And that was the first production.

Q65. And has the feature been incorporated in automatic machines made by the Beam Company ever since?

A. Yes, sir. There has been some portion of the production that hasn't had the tube on, but all of them have had the sediment trap.

Q66. Now, we have a series of photographs here that have been marked for identification as Exhibits 14-PH-1 to 14-PH-5, which opposing counsel has agreed to stipulate shows certain physical models or exhibits that are at the present time in Chicago and which we couldn't conveniently bring down here. But, do you recall having seen the particular structures shown in those photographs?

A. Yes, sir.

Q67. What are they in a general way, Mr. Castner?

A. Well, 14-PH-1 is a cross-section of our original design of tub, balance ring, agitator and sediment trap with the two vertical tubes.

138 14-PH-2 shows two different designs of an alumi-

num casting that shows our original design of the sediment trap as incorporated right in the casting.

14-PH-3 is a later design of the tub with a balance ring inside it and the perforations at the top of the tub and it shows the spiral tube as disclosed in the Roth patent.

14-PH-4 is a cross-section of the Norge tub as incorporated in some of their early productions.

It shows the vertical tube.

14-PH-5 is a view of the later Norge tub showing the tube coming out from their sediment trap in a tangent direction as it leaves the recess and then reverts to a vertical position.

Q68. Now the two tubs, Plaintiff's Exhibits 18 and 19, as shown in Exhibits 14-PH-4 and 5, you refer to as Norge tubs. Where did those particular tubs come from?

A. Well, those were the tubs that were supplied to us by the Norge Company.

Q69. Is that also true with respect to the agitator
139 marked Plaintiff's Exhibit 18A as shown in 14-PH-4?

A. I don't recall about the agitator. I think that was taken out of one of the tubs of one of the Norge machines that we were testing.

Q70. In the tubs shown in 14-PH-1, 4 and 5, have been cut away, or sections out. Do you know how that occurred and why?

A. Yes. When you were accumulating these exhibits you asked us to have those parts delivered to Art Lund's home in Minneapolis. He's the man I previously referred to as having worked on some of that development work at the start. He has a fairly complete little shop there and it was out there that they were cut apart to get those sectional views.

Q71. And did you see these particular physical exhibits before these pictures were taken and before the units were sent to Chicago?

A. Yes, sir, I did.

Q72. And are they as shown in those pictures in the same condition as far as you can tell as they were at that time?

A. I would say that they were in the same condition.

140 Q73. Were you present when the labels were attached to those particular exhibits?

A. Yes. I see these markings on them. Seems to me that those were the markings that were put on.

Q74. Well, those markings that you just point to were put on for the purpose of taking the pictures, Mr. Castner. I am speaking of the labels that you can't read there, but, have the same markings on them.

A. Yes. That's right.

Q75. Do you recall that such labels were placed on there?

A. Yes, I do.

Q76. In the photograph Plaintiff's Exhibit 14-PH-1, the agitator is not in its normal position, is it?

A. No. That's in a raised position so that you can see the sediment trap. If it was in its normal position, it would have blocked the view that's otherwise available.

Q77. Now, will you briefly describe the structure as it is shown in Plaintiff's Exhibit 14-PH-1 so that the

141 Court will understand that particular structure when he sees the physical exhibit?

A. This shows the tub with a solid wall as a slight vertical taper outward. It shows the escape holes at the top edge of the tub. It shows the casting that incorporates the

sediment trap with the two tubes attached to the trap and the TOP of the tubes coming out above the wash water level. It shows the dished bottom of the tub and what we called a clamping ring. It was screwed down to the sediment trap casting and formed an overhanging lip as I have previously described.

Q78. Is that the ring that is shown as having been cut substantially diametrically so that you see the two ends immediately above the base portion?

A. Yes, sir.

Q79. And that ring is attached to, you say, by screws to the base?

A. Yes.

Q80. And is the tub proper clamped between those two parts by those screws?

A. Yes, it is.

Q81. Now, that is the first type of tub and tube
142 arrangement which you manufactured. Is that correct?

A. Yes, sir.

Q82. And in that instance, you used two tubes diametrically opposed to each other?

A. Yes, sir.

Q83. And that is as it is also shown in your reissue patent Fig. 1 of your reissue patent No. 23,626?

A. Yes, sir.

Q84. And did that construction substantially follow the construction as shown in the patent drawings?

A. As relates to the mounting of the agitator, the sediment trap, the tubes and so forth, it is practically identical.

Q85. There were some changes in the upper end of the tube proper. Is that correct?

A. That's right. Which had no bearing on the functioning of the sediment trap and the tubes, however.

Q86. The question has come up very recently, Mr. Castner, in connection with the type of agitator that is shown as 14A in Plaintiff's Exhibit 14-PH-1, one of
143 Mr. Ooms' associates called my attention to the fact that when that particular agitator is placed in the tub or in one of the other tubs, it scrapes on the bottom. Do you have any explanation for that?

A. I don't know just what exhibit or production sample you are referring to. Some of the early, real early productions, we were dependent upon a set screw to hold that up and it may be, if it is one of the samples of that early production, it might have slipped. But for several years we have been using an adjustable lug at the top of the agitator shaft so that as the machines go down the production line, a gauge is used to space the bottom of that agitator to get it at the proper distance from the bottom of the tub and if it is too snug a spacer is put in there so that there is a ready adjustment to compensate for any situation where the agitator might touch the tub and it might be that on that sample that little spacer had slipped away. I don't know.

Q87. But ordinarily, the agitators are intended for interchangeability on various types of tubs?

A. That's correct. And to maintain a fairly uniform distance from the bottom of the tub.

144 Q88. Now, Plaintiff's Exhibits 15 and 16, as shown in 14-PH-2, will you explain a little bit as to their construction and why two elevations are necessary?

A. Well, actually, it might have been just as well to submit just the one of these as an exhibit instead of the two. But as I recall it, Mr. Ooms wanted copies of everything and the drawings for them. Because these two de-

signs are practically identical except that No. 15 is a little heavier in its structure in that it is made from a permanent mold. Whereas, the lower one, No. 16, is a little lighter in weight and is made of two die cast parts, this upper portion being bolted to the bottom one.

Q89. Is the form of the sediment trap or channel, itself, about the same in both instances?

A. Practically the same in function.

Q90. And how would you describe the shape of the sediment trap?

A. Well, it's annular in shape and is concentric with the outer diameter in the area of the tubes being slightly larger.

Q91. Are you referring to the sort of eliptic, or
145 funnel-shaped, characteristics at the two opposite sides of the trap?

A. That's right. But they are symmetrical and would ordinarily be considered concentric.

Q92. What was the purpose of that funnel shape for the tube? What was the reason for it?

A. We thought it would add a little extra impetus to the ejection of the heavy soil and the centrifugal force would drive it maybe a little more readily to the tube and down through the tube.

Q93. Now, I refer you to the second form of your device as evidenced by Plaintiff's Exhibit 17, as shown in 14-PH-3, and ask you to describe that particular structure by way of comparison with the earlier structure.

A. Well, this has the single tube on it with the top end trailing and it is the so-called Roth design as disclosed in the Roth patent application. This, we worked on, or rather Mr. Roth and his boys in the engineering worked on with the idea that by having the upper, or having the open end

trailing, the entry end for heavy soil, that it would add additional force and give not only the force of centrifuging but a sort of a jet action to effect the ejection of the heavy soil a little better. It also shows a different design of the top structure of the tub which has no bearing, whatsoever, on the functioning of the sediment trap or the ejection tube.

146

Q94. In that device, you only used one tube. Is that correct?

A. That's correct.

Q95. Did you continue to use the same form of sediment trap channel such as you have described in connection with the structure shown on Plaintiff's 14-PH-2?

A. It is very similar but in some of the later designs, we did not have that funnel shape, or so much of it at the trap primarily, because it affected economies in the cost of the dies to produce them and it still worked efficiently in a practical way to do the job.

Q96. That is with the Roth type tube?

A. With the Roth type tube and without the funnel effect at the entry to the tube.

Q97. Did you examine quite closely the structures shown in Plaintiff's 14-PH-4 and 14-PH-5, Mr. Castner?

147

A. Yes, I did.

Q98. And have you actually seen such tubs in washing machines?

A. Oh, yes. We saw those in machines in our laboratory such as we have of all competitors' machines where we are going through the routine, checking to keep up on everything that's going on.

Q99. Have you examined these particular structures quite closely?

A. Yes. We have.

Q100. Will you first, taking Plaintiff's 14-PH-4, describe your understanding of the structure therein shown?

A. The tub at the bottom is dished in a manner similar to the Beam tub although the view does not show that too clearly, but it does have that dished effect that carries on to the under side of the agitator and lower portion of that tub has a series of holes around it where the dished portion meets these series of holes. There is then a raised portion that carries to a smaller diameter around their post casting
which is open for a fraction of an inch so as to
148 permit water circulation through the holes and out through there.

Q101. Mr. Castner, you seem to be having a little difficulty because those holes are not shown. Are these the holes that appear in the stipulated drawing, Plaintiff's Exhibit 1?

A. That's correct.

Q102. And do they also show in Fig. 4 and 3 of that exhibit?

A. Yes. That shows much more clearly than 14-PH-4 does. It shows how the tub is formed with a gasket under to seal it off and provide an annular recess with a series of perforated holes to permit the soil to enter the recess so constructed.

Q103. Now, what is the shape of this recess that you have been talking about in defendant's first design of tub structure as shown in 14-PH-4?

A. Well, this does not show it very well.

Q104. Well, do you recall what the shape of that recess was?

A. Well, it was round in form and, as I recall it, slightly eccentric.

Q105. What was the nature of the discharge tube in that first defendant's machine?

149 A. Well, the tube was very similar to our original tubes that we had in our original machine. We had the two tubes where they used the one such as we did in the Roth design.

Q106. But the tube in the defendant's machine we are talking about, did it function similar to the one in your first machine?

Mr. Ooms: That's objected to as leading. I know you can get to it and I haven't objected to leading questions to save time. Aren't you getting awfully close to an objectionable question when you ask him?

Mr. Carlsen: I will rephrase the question.

Q107. Are you sufficiently familiar with the defendant's structure such as shown in Plaintiff's Exhibit 14-PH-4 to express an opinion as to the physical and functional similarity or dissimilarity between that device and that of the first Beam machine?

A. The tube is attached in a very similar manner to the annular recess that forms a trap for their soil

150 and the functioning of it would be identical in that when the tube with the wash water, clothes, suds, went into the spin, centrifugal force would cause that inverted cone effect of the water and it would drain water out through that tube and slosh the heavy soil out through the tube in a manner identical to that in the original Castner design as embodied in the Beam products.

Q108. And what becomes, if you know, of the larger body of water within the tub? How is that discharged?

A. That would be discharged in a similar manner in that floating suds or scum would go off over the top and the main body of water then would go through the clothes and

climb the side walls and out through the escape holes at the top of the tub.

Q109. Now, before we take a recess, would you please briefly explain the structure shown in Plaintiff's Exhibit 14-PH-5, which has been stipulated to represent the defendant's so-called second design machine?

A. Before I describe that, I would like to point
151 out, too, that on 14-PH-4, that the design of that dished portion of the tub has the holes in it and the portion between the castings that forms the annular recess is a greater diameter and therefore the tub just outside of the series of circular holes forms an overhanging lip that would prevent any soil from going out of the tub in the manner that the overhanging lip of the Castner design does that same function.

Q110. Very well. Now, will you proceed with the last photograph?

A. Exhibit 14-PH-5 is the latest design that I have of the Norge tub structure and tube, and was the tub as submitted by Norge to us.

Q111. How does it differ from the first form of Norge tub?

A. It differs in that the casting has an exit hole that comes out at a tangent and the tube is attached to the casting in alignment with that exit hole so that the lower portion of the tube is at a tangent to the outer diameter, or to the diameter (not the outer diameter), to the diameter of the annular recess. It then comes up straight but the top of the tube right near the top of the tub is trailing the
152 front end where the soil enters at the start. It also shows a cavity in the casting where the tube is attached. This cavity, as I see it, would not affect the functioning to any extent other than that it might provide a little greater reservoir for accumulation of sediment.

Mr. Carlsen: Mr. Ooms, the prints that the witness has been testifying about this morning are, I think you will agree, duplicates of the photographs attached to the stipulation dated March 22, 1956?

Mr. Ooms: That's agreed to.

Mr. Carlsen: And if you have no objection I will have these separate prints which the witness used marked by the reporter for introduction into evidence at the trial in preference to those attached to the stipulation.

Mr. Ooms: That's agreeable.

Q112. This morning, Mr. Castner, you testified about the operation of various machines or assemblies, both the plaintiff and defendant. Is it practical or feasible to demonstrate these operations visually in any manner?

A. The ejection of that water is a difficult one. We tried at times to put a stroboscope on it and we thought of getting transparent plastic tubs and things of that kind but we couldn't make anything work successfully because that water comes out of there with such force and the spray and the throw and the whole thing, that we never worked out anything that was a practical means of measurement.

153

Q113. Or to make a demonstration?

A. That's right.

Q114. You testified this morning that at least a small part of your—in a small part of your production, the tubes were left off of the traps and tubs. What was the reason for that?

A. Well, that was primarily to save the cost in our efforts to get the leader low priced machine and also to when we put that low price on it, we still wanted to sell the higher priced machines so the absence of the sales feature on that made it easier to step them up to the better quality machines.

There was one other reason, also, and that came up particularly in supplying machines to some of those
154 other accounts beyond what we considered our four major accounts so that there would be less confusion in the field with these other smaller accounts and so that we weren't building for the long pull, would not have the advantage of that, and cause conflict in the sales story that they put out.

As an example, we supplied the Dexter Company. We knew that that wasn't any long pull program. They were working to get their own automatic and so we weren't too interested in giving them the best and when Philco bought them out, why, that same thing prevailed and we knew that was a short lived field although I guess today, at least the time that I left, why, Philco through the Dexter Company was still buying their machines from us. But none of them at that time had that sediment tube on them.

The same is true of another little account, the Midwest Metals, the one minute washer company at Kellogg, Iowa.

So there were those reasons, three of them, basically; to save costs.

Q115. This matter of eliminating a tube in some machines and not in others, did that compare with
155 the elimination or addition of any other features in your machine?

A. Yes. Generally it was a model that we considered stripped down. It didn't have the ornamental trim on it. The controls were ordinarily a little simplified and cheaper and the cabinet was ordinarily simpler and so forth.

Q116. So it was a cheaper machine all the way around but still an automatic. Is that correct?

A. That's right.

Q117. Do you know whether or not that was common practice with other concerns in the field?

A. I think it is pretty general. If they have flexibility to add one thing or another, why, I think it's pretty common. Nearly all of them do it. They simplify the cabinet and eliminate certain features on their cheaper models.

Q118. When the tube is left off and you just have the trap, do I understand you correctly that the agitator must be removed and the grit and sediment removed manually?

A. That's correct. And the sediment, the heavy soil, would be trapped in there due to the overhanging
156 lip and there is no way of removing that sediment, as well as a little water that is trapped under there also, without removing the agitator and manually scraping it out.

Q119. Does the fact that water is also retained in the trap and cannot be expelled automatically, does that create any sanitation condition?

A. Well, I, normally, if they are using their washer daily, or every other day, why, it wouldn't be too adverse. But if it's going to stand around for two or three weeks, why, it might get a little bad.

Q120. Now, in addition to your duties with the Beam Company were you ever active in washing machine associations organization work?

A. Yes, I was, over a period of years. I served on various committees and on the board of directors. I served a term as president of the association.

Q121. What association was that?

A. That's the American Home Laundry Manufacturing Association.

Q122. What year was that, do you remember?

A. That was 1950. And afterwards, I served on
157 the advisory committee as a result of having been president and at this time, after I retired, they made

me an honorary lifetime member so that I am still in touch with things.

Q123. Did those connections enable you to become acquainted with the various members of the industry?

A. Yes. It did very definitely. And I think in general I was on a very friendly basis with all those in the industry with whom I came in contact.

Q124. Getting back to your own company now, did you ever sell any washing machines under the Beam or Solar names as trade-marks? Brand names?

A. We never sold any under the Solar name. We did put up some few machines at various times and even had some pieces of literature made up under the Beam name but something always happened where we got sidetracked and we never made any real effort to follow through under the Beam trade-mark name.

Q125. Now with reference to the machines that were sold through the Gamble-Skogmo organization, what trade-mark or trade-marks were they sold under?

A. Under the name of Coronada.

158 Q126. Were they all sold under the Coronada trade-mark that you know of?

A. Yes. That's the only name that I know of that they ever merchandised at and that was to practically all of their plants which are under that name.

Q127. Now, you referred to your four major customers, I believe you called them. Would you state just who they were and, if you know, what trade-marks they sold these machines under?

A. Well, there's the Gamble-Skogmo Company with the Coronada name that we just referred to; and there's the Western Auto Supply Company of Kansas City, and their trade name was Wizard; and there is a Firestone

Company, Firestone Tire & Rubber Company of Akron, Ohio, under the trade name of Firestone. Then the fourth of that group was the Associated Merchandising Corporation, a buying organization for a group of department stores, and the trade name that they followed was AMC.

Q128. Now, these four companies that you have mentioned, are they all substantial members of the washing machine distribution industry, if you want to call it that?

159 A. They are considered to be pretty substantial distribution outlets in the industry.

Q129. And are these trade-marks that you have referred to all well known trade-marks in the field?

A. Yes. They do considerable advertising and through the number of outlets that they have and the markets that they go into, why, they are pretty well established. Pretty well known.

Q130. How about the Dexter Company that you referred to?

A. Well, the Dexter Company put most of theirs out under their Dexter name. They did have another brand name. I think it was Haig. And they put some out under that name. I think in one instance they went through distributors and in the other, they went direct to dealers. I think that was the reason that they followed the two names.

Q131. Now, in supplying these machines to these various companies, to what extent were the machines similar? To what extent, if any, were they different structurally or in appearance or in any way you care to comment?

A. Well, the structural characteristics were almost
160 practically identical in that the same base and mechanism was used throughout and actually the exterior appearance, up until 1952 (I am not sure of that

date. It was approximate), that was identical. We didn't make any effort to get even different cabinets. But then, approximately 1952, then we started to get into different exterior appearances as much as we could particularly as related to the control knobs and the panels and trim and, in many instances actually, the shape of the top or the front panel.

Q132. What was the reason for making the appearance of these various machines different?

A. Well, those four principal accounts often merchandised in the same market and they all had their own individual style of marketing or selling their machines and it helped them, or they all felt better, if they had some individual features so that they can point to those things as being a different machine than one of the other accounts that I referred to.

Q133. But as far as the mechanical construction or the operating mechanism was concerned, was that substantially the same in all of them then?

161 A. Yes. It was, practically. Yes, in all of them.

Q134. Came off the same assembly line, did they?

A. Yes.

Q135. Are you prepared to give us some information with reference to the numbers of automatic machines, washing machines, that were sold or built by Beam and sold through these various companies over a period of time that you supplied them?

A. I can. I can give you some general figures. Or, if I can refer to some.

Q136. You can use whatever notes you have, memoranda that you have, Mr. Castner, and I would suggest that you not go too much into detail, but give us some overall figures as to the numbers of machines that have been sold through these various outlets or distributors.

(Discussion off the record.)

Q137. Mr. Castner, are you prepared and if you can, give us the figures in so far as they apply to machines that use the entire sediment trap and tube assembly and those that omitted the tube? We would like to have those figures.

A. Well, the figures that I have were accurate up through the first quarter of 1955. I am talking now of the Beam products.

162

That was 169,126. And from what information I have had from Webster City, it looks like they had about 30 or 31 thousand in the last three quarters so that would make the total overall Beam production since the start of 1947 up to the end of 1955 right at 200,000 units.

Now, of that 200,000 I would have accurate information up through the first three months of '55 that there were 17,546 that did not have the tube. And estimating those without tube for the last three quarters of 1955 it would be right at 7,500. Making a total of 25,000 out of 200,000 that had the sediment trap but did not have the tube attached to it, or, about 12½ per cent since the start of production."

Mr. Ooms: Your Honor, as to some of these figures, I move to strike anything that the witness testified to that could be sustained by records or summaries from the factory. He did not have them there. He did not have even the production figures for the year 1955, which he admitted later had been accumulated and were available, but he was using merely estimates.

163

I make this objection now and we move to strike all of that material that is not the best evidence of the facts.

Now, if counsel has got the information I requested from the factory, we can agree on the figures; but certainly, this is no way of proving the figures for 1955, when there were records in existence.

Mr. Carlsen: I can only respond to that by stating that in view of the change of ownership and change in management and the merger and one thing and another, we do not have those figures available; and I can only ask the Court to consider in the light of subsequent evidence that I will produce, such as circulars, and so on, that these various companies, customers of the Beam Company, actually did sell these machines, at least the major portion
164 of them, with tubes; to conform to the testimony of firsthand knowledge of the facts as it certainly was had by Mr. Castner better than by anyone else.

Mr. Ooms: I cannot understand how a corporation which is coming into this Court, trying to tell your Honor that they received a million dollars worth of royalties, and the general counsel comes down here to testify about it, and says he does not know what it was paid for.

Now we are coming to the point of the sales of their own machines out of their own factory, and they say, and I have no quarrel with the figures for the first quarter of 1955 because Mr. Castner was testifying from summaries, which I am sure we would have agreed upon, but when he goes beyond the first quarter he has nothing but a projection; he has no figures; and I think everybody knows that any business that is in the first quarter of 1956 to operate must have its figures for the year 1955 and prob-
165 ably even for the first quarter of 1956; and until those figures are produced from the records, I think that I am correct in making a motion to strike all that evidence as not being the best evidence; and I did give counsel on this record that warning when he took the deposition last week that I would interpose this objection.

The Court: Do you say you don't have the records?

Mr. Carlsen: We don't have them available. They prob-

ably could be dug up, but not at this late date, your Honor. That is our main problem. I am quite willing to go along with Mr. Ooms' objection where the witness has projected them and estimated the figures beyond the first quarter of 1955. I don't think it is a critical matter.

Mr. Ooms: I do think it is critical, and I will tell your Honor why. Because in the year 1953 they began to put out this machine with the sediment trap without a tube,

166 and I think counsel will agree with me that such a machine does not respond to the patents. You will, will you not, Mr. Carlsen?.

Mr. Carlsen: That is correct.

Mr. Ooms: And they began to do that in 1953, and by the end of the first quarter of 1955, the first quarter's production of the machines without the tube which could have been added at a few cents cost, 30 to 40 cents, 30 per cent of their production, 29.4 of it, was of that type, which indicated instead of this being a great overwhelming invention that counsel and plaintiff seek to make of it, was something that when they came to putting out a hundred dollar machine at the factory, to save 40 cents, they left it off. I think the figures for 1955 are extremely critical because of that very fact; and we warned them when we took Mr. Castner's deposition in the spring of 1955, on April 10th, that we wanted these figures and they would supply them to us.

167 Mr. Carlsen: That was a year ago, before the 1955 production took place that you are now interested in.

Mr. Ooms: That is correct. We told them we wanted all the figures on the relative quantities with and without the patented features.

Mr. Carlsen: I think your Honor will be convinced be-

fore we get through that there has been a terrific amount of commercial success in the washing machines having the tube. Now, we are the present moment going into the facts and figures as Mr. Castner knew about them, with the figures that he had available to him. That is still a small proportion of the total number of machines including those p[illegible] out by licensees and which we will come to presently, and where we have more definite information. I don't think it is too critical to know precisely what they did in 1955.

Mr. Castner has already explained the reason why
168 they left the tubes off. That is why I wanted your Honor to have that particular part of the deposition read, because there was a very definite reason, and the 40 cents does not mean a thing when we are coming into problems like this, because when they sell different grades of machines and have these step-up prices, it is not the 40 cents that counts, but the overall picture. They are selling and displaying and probably advertising a cheaper machine, and a customer comes in and looks at it, and they say for twenty-five, thirty, forty or fifty dollars more you can have all these additional features. So the fact that they leave the tube off of the machine is not determinative at all that this invention has lost its value, because it is still put in all of these deluxe machines as far as we know.

Mr. Ooms: Well, your Honor, just to answer that last point of whether this is critical, this is something that coun-
sel went into with this witness in Florida last
168A week, and he went into it at great length as your Honor will see this testimony developed. I have no objection to having it read with the understanding that my objection goes to it, but he actually went to the point of calculating how many of these tubeless machines as against their entire production had been produced in the history

of the company, and he came out with a figure of 12½ per cent. The reason they are trying to conceal the 1955 figures is because it is 30 per cent. I think it is very important when they are attempting to use commercial success.

The Court: How do you know it is 30 per cent?

Mr. Carlsen: We admitted it at the hearing last week, 29.4.

Mr. Ooms: The first quarter of 1955 they had figures, and it was 29.4, but from then on they gave us no figures from the records.

The Court: If your records indicate that, or you have
169 records to show that, I think you ought to produce them.

Mr. Carlsen: I am sorry, we don't have them. The Beam Company is no longer owned by Gamble, the present plaintiff, and we do not have those records. We have had quite a bit of trouble trying to get any information out of them up there. As a matter of fact, we don't know whether they have them. That is the only answer I can give you.

Mr. Ooms: I just have one more point, and that is, that I shall, of course, rely upon that principle of evidence, that if the evidence is available and not produced, the presumption is that it is adverse to the party who should have produced it.

The Court: You may proceed with the evidence. I have in mind your objection.

Mr. Ooms: May it go in with that understanding, that it is subject to that objection?

The Court: Yes.

(Reading of Castner deposition resumed, as follows:)

170 "Q138. Can you break those figures down to show the number of machines that had the tube that used

the straight, or Castner type, of tube as distinguished from the Roth type of tube?

A. The accurate figures from the start up through the first quarter of '55 were 89,426 with the straight tube and 62,154 with the Roth tube. By estimating the same manner as I referred to before for the last three-quarters of 1955, there would be 22,500 more, all with the Roth tube, making a total of 64,654 with the Roth tube and 89,426 with the straight tube.

Q139. You no longer use the straight tube in any of the production as far as you know. Is that correct?

A. That's correct.

Q140. You have gone to the Roth type exclusively?

A. Yes. There are two different types of Roth tubes, I might point out. There is a type as pictured there and then there's the other one that comes up straight for a ways and bends off the opening at practically a true horizontal position.

Q141. Mr. Castner, over the period of years from
171 1947 through 1955, what would be the average retail price of one of these automatic machines? Could you give an estimate as to that?

A. Well, they have sold anywhere from $200 to $300. Maybe $250 isn't too far off.

Q142. Well, if you multiplied the number of machines sold by that amount of $250 per machine that would represent a fair total resales value of these machines?

A. Yes. It would. The way I figure that out, there's about 175,000 at $250 would be $43,750,000.

Q143. And those figures do not have anything to do with the sales or manufacture by the various licensees?

A. No. This referred specifically to those machines as produced at the Beam factory in Webster City.

Q144. Now, what licenses were granted under these patents to licensees?

A. Well, there was the license granted to Hotpoint of Chicago, a division now of the General Electric Company. The Speed Queen Company of Ripon, Wisconsin. The Easy Washing Machine Corporation at Syracuse, New York. In addition to that, there were licenses granted to the Dexter Company of Fairfield, Iowa, and also to a Davis Machine Company, a subsidiary of the Philco Corporation of Philadelphia. The latter two companies took licenses but, for various reasons, never did get into production. There was also a license granted to the Simpson Company of Australia. The latter company got into production just the middle or latter part of 1955 but I understand that they are fairly active at this time.

172

Q145. Well, which are your currently or presently active licensees in this country?

A. Well, that's the Hotpoint Company, the Speed Queen Company and the Easy Washing Machine Corporation.

Q146. And this Hotpoint Company, did you say that was a division of General Electric Company?

A. Yes, sir.

Q147. And under your license with the Hotpoint Company, does General Electric have the right to use these features if it wants to?

A. Yes, they do.

Q148. And under these licenses, all of your licensees have the right to manufacture and do manufacture machines having the sediment trap feature of your patents in this suit. Is that correct?

173

A. Yes, sir.

Q149. Now, you have referred to the sediment trap feature as found in these patents to be one of two or three

major features that are subject to these licenses. Is that correct?

A. That is correct. And it is so defined in the license agreements.

Q150. And you consider the sediment trap feature as a minor or a major feature in connection with these licenses?"

Mr. Ooms: I object to that as leadng and also as a question to which he can give only the most general answer which has no probative value here. You are asking the witness for merely an opinion as to how he considers it, which is a purely subjective matter.

Mr. Carlsen: I rephrased the question, your Honor.

"Q151. Well, have these three companies, Hotpoint, Speed Queen and Easy, all used the sediment trap feature?

A. Yes, sir.

174 Q152. And have they sold substantial numbers of washing machines embodying the sediment trap feature as we have been referring to it. today?

A. Yes, sir.

Q153. Can you tell us what trade-marks these various companies have sold washing machines under that embody these features?

A. Well, the Hotpoint Company exclusively uses the trade name, 'Hotpoint'. The Speed Queen Company exclusively uses the name 'Speed Queen'. And the Easy Washing Machine Corporation exclusively uses the name 'Easy'.

Q154. And are these trade-marks all well known trademarks on washing machine in the trade?

A. Those three companies are considered very substantial producers and suppliers of washing machines in the industry and always spend a lot of money in their advertising.

Q155. Did you personally participate in any negotiations leading up to these license agreements?

A. Yes. In all instances I carried on the negotiations.

Q156. In doing so, Mr. Castner, did you start out
175 with the idea of selling license agreements or did these people come to you or how did these negotiations originate?

A. Well, in all instances we were solicited by these companies. We had no intended program of licensees and it was only because they came to us and we were also solicited by other companies that we did not enter into license agreements with and which apparently we could have, had we been so inclined.

Q157. Inasmuch as Mr. Ooms has agreed to stipulate these various agreements into evidence I don't care to go into all of them but, can you state generally, Mr. Castner, if they are all still in effect and all operating?

A. They were all actively operating at the time that I left the Beam Company and from everything I have heard they are actively producing under these licenses at this time.

Q158. And are they paying their royalties all currently?

A. Yes.

176 Q159. Did you, prior to your retirement, or at any time since then, make any inquiry to your three major licensees to determine whether or not they were using the sediment trap feature, and particularly the tube?

A. Yes, I did. When this question came up last year I wrote to those three companies asking them to give us the information as to what they were doing with the sediment trap feature and the tube connection therewith."

Mr. Ooms: If your Honor please, at this point counsel is going to go into three letters from the licensees which deal with this. Of course, they are the most obvious kind of hearsay, and I will make the objection. I merely want to

make it now so as the question is answered or read your Honor will know that I object to the receipt of these letters as hearsay.

Mr. Carlsen: I don't know that that objection needs any response. These letters are mimeographed or processed copies of letters that Mr. Castner states were received
177 by him in the regular order of business, and Mr. Ooms did not even object to the use of substitutes or photostatic copies.

Mr. Ooms: I have no objection to the use of photostatic copies at any time. My objection goes to the fact that these are not correspondence in the regular course of business. He wrote a letter of inquiry to three people, and he is using their answers to prove a fact which is critical here. I say that is hearsay, and that the letters are objectionable.

Mr. Carlsen: That is a matter we can hardly go into now. The only objection he offered during the taking of the deposition was the fact that the letter of inquiry that these letters refer to, we did not have a copy of at the time; and I have since mailed Mr. Ooms a copy of the letter of inquiry, and I think he has withdrawn that objection. Certainly the witness can testify, even though he did make inquiry, as to the substance of these letters. He is giving the very information that Mr. Ooms is asking for, what
178 percentage of the machines have the tube and what did not have the tube.

Mr. Ooms: We can't go into the whole deposition in five minutes, but your Honor, this is the point: Mr. Castner, seeking to arrogate to these patents something beyond that which they are entitled to, attempts in this deposition as it develops to show that each of these companies put on the sediment trap, and he does it by a letter from each of them. Then when it comes to the two other features upon

which they actually paid royalties, he professes ignorance. He says, "I don't know whether they have the snubber and fluid drive." We spent pages and pages on that question. He is going to attempt now to profess ignorance as to two features of it, and use hearsay to prove the presence of the third.

Now, there is certainly better evidence to prove that fact, which is critical in view of the assertion of commercial success here.—

The Court: Well, of course, the best evidence would
179 be to take the depositions of whoever those letters are from, so you would have a right to cross examine them. That would be the best evidence.

Mr. Ooms: One of the men is in town. I think we will have him under subpoena today, so we will at least relieve counsel of that burden. If the Hotpoint man is in town, we will have him under subpoena.

Mr. Carlsen: I have been talking with him myself trying to get the information.

Mr. Ooms: Is he coming in?

Mr. Carlsen: No. He did not want to come in voluntarily. He did not want to get into any part of this lawsuit, or take any sides. But he has not even been able to tell me, at least—maybe he has you, Mr. Ooms—who has custody of these records or where these records are or whether they have even got them.

Mr. Ooms: I have not talked to him. I don't know the man. I simply sent out a boy with a subpoena duces tecum this morning.

Mr. Carlsen: To Mr. Hubbard?

Mr. Ooms: Yes.

180 Mr. Carlsen: Well, I have no objection to Mr. Hubbard coming in here. I have talked to him over the

telephone, I had a pleasant conversation; but he has told me frankly that he does not know for sure where these records are. It is a tremendously large organization, this Hotpoint Company. They have eight or ten plants here in Chicago. He does not know who has custody of those records, so who are we going to subpoena?

The Court: Someone in the firm ought to know who has charge of them.

Mr. Carlsen: Well, that is what he is hoping to tell me by noon today. That is as close as I can come. He has promised to try to find that out for me by noon today. If you have subpoenaed Mr. Hubbard, we probably don't need to.

The Court: I will reserve my ruling on the admissibility of those letters.

Mr. Carlsen: All right, sir.

"Q160. Now, you have provided me on a previous occasion with some copies of what appear to be replies to those inquiries and I will ask you if you can
181 recognize those as the responses you received that time?

A. Yes. One is the letter of May 13 from the Speed Queen Company which reads as follows: 'In reply to your May 10 letter, please be advised we have used the sediment trap and sediment tube on all of our products to date except for our Model A-16. This Model A-16 is our semi-automatic machine and was placed in production in July of 1954.

We trust that this information will serve your purpose.'

Q161. Who was that letter signed by?"

A. Well, that was signed by 'Jack,' Executive Vice-President, who is J. V. Murray.

Q162. Are you well acquainted with Mr. Murray?

A. Yes, I am.

And in a later conversation with him he said that Model A-16 was practically a dead one."

Mr. Ooms: I move that statement be stricken as purely hearsay.

The Court: Yes. Sustained. Strike it.

"Q163. Do you have any knowledge of what that Model A-16 or A-15 machine is of your own knowledge, Mr. Castner?

182 A. Yes. It is a model where they manually filled it by turning the faucet on and turning it off and it has a simplified timer on it so that it would go through the washing cycle and then shut off. So that it is necessary for the operator to go back then and manually fill it again with rinse water and then set the timer for it to agitate and spin and then shut off again. So that it is not in any manner a fully automatic machine and requires quite a bit of attendance.

Q164. Would that have been a machine, do you know, that would come within the classification of other low bracket cheaper machines that you referred to this morning?

A. That's right.

Q165. Now, will you go on with the next letter, please?

A. The next letter is dated May 20 from the Easy Washing Machine Corporation and that is signed by Phillip B. Glassey, Vice-President.

"This is in reply to your letter of May 10 inquiring about our using of the sediment trap and sediment tube on our production of automatic washing machines. We

183 have used the sediment trap and tube on all machines manufactured and are using them at the present time.

I hope that your inquiry was not prompted because of

conflict with some other patents. If so, please keep me advised.'

Q166. Who was that signed by?

A. Phillip B. Glassey, Vice-President.

Q167. Will you then read from the third letter?

A. The third letter is from the Hot Point Company, dated May 23, 1955, and was signed by A. G. Hubbard, Patent Counsel. He said, 'It was pleasant to talk to you this morning concerning the matters raised in your letter of May 10, 1955, relative to patent marking and the use of sediment ejection devices. Some years ago, the General Electric Company decided to make the matter of marking patents on nameplates and the like optional with the various manufacturing divisions. In the Appliance field it has been decided not to mark the appliances with patent numbers in view of the difficulties of keeping the nameplates up to date and the relatively small legal advantage which derives from patent markings.

In view of the fact that our license agreement with
184 you does not call for patent marking, we followed our normal practice of not marking. We prefer, if at all possible, to maintain a strictly neutral attitude in connection with the litigation which you have brought against Norge. For that reason, unless compelled to do so, we would rather not make any statements concerning the use of sediment ejection devices on our automatic washing machines.'

Signed, 'A. G. Hubbard, Patent Counsel.'

Q168. Do you know of your own knowledge what the situation is with reference to Hot Point's use of sediment tube on some or all of its machines at the present time?

A. At the present time, they are using a sediment tube on some of their products.

Q169. These letters, are they copies of original letters that you received in the due course, Mr. Castner?

A. Yes, sir. Yes, they would be exact duplicate copies.

Q170. Do you know where the original copies of those letters are at the present time?

A. Why, they would most likely be in the Beam files, I imagine.

Q171. Up in Webster City?

185 A. Yes. I don't know that for sure. We got them out. Now, whether or not they were retained or returned to the files—

Mr. Carlsen: Mr. Ooms, will you accept these ozalid copies of these letters in lieu of the originals?

Mr. Ooms: We raise no question as to the use of copies rather than originals. Of course, other objections aren't waived by that.

I wonder if you have the letters of inquiry to which there were replied?

Mr. Carlsen: I do not. I will ask the witness.

Q172. Do you have the original or copies of the original letters of inquiry to which these were replies, Mr. Castner?

A. No, I do not.

Q173. You think they are at Webster City, also?

A. I imagine they are. All it was was a letter inquiring as to the quantities of machines that had the sediment trap on and those that also had the tube on.

Mr. Carlsen: I will ask the reporter to mark these
186 letters for identification as Plaintiff's Exhibits 30, 31 and 32, respectively, in the order in which they were discussed by the witness."

Mr. Carlsen: And under those designations I now offer those letters in evidence, subject, of course, to the objection that Mr. Ooms has already made.

The Court: All right.

(Plaintiff's Exhibits 30, 31 and 32 were received in evidence.)

Mr. Carlsen: Plaintiff's Exhibit 30 is the letter of May 13th from the Speed Queen Corporation; Plaintiff's Exhibit 31 is the letter of May 20th from the Easy Washing Machine Corporation; and Plaintiff's Exhibit 32 is the letter of May 23rd, 1955, from the Hotpoint Company.

You waive now, Mr. Ooms, requirement for the copy of the inquiry letter which I showed you last evening?

Mr. Ooms: Yes. I have no interest in that at this time.

"Q174. Do you know why the Hotpoint Company has discontinued the use of the tube in some of its 187 models of machines?

A. I don't know at this time just what the situation is or what the reasons are. The first that I heard they weren't using it was during, or immediately after, the Korean War when aluminum was at such a premium and we were being allowed such small quantities that it was controlling washer production to a considerable degree. At least they weren't allowing us enough aluminum to keep pace with the normal requirements and they told me at that time that was the reason."

Mr. Ooms: Object to the statement that Hotpoint told him at that time that was the reason; pure hearsay.

The Court: Yes. Sustained.

"A. (continuing) And later, they made some variations which I did not know exactly what prompted it except that in the background there was that avowed purpose on the part of Hotpoint to work out from under the patents when they could to save on their royalties or eliminate them.

Q175. How long have they been trying to do that, Mr. Castner, that you know of?

A. Well, they have been working on that since
188 the very start. In fact at the time of signing that first license agreement with Mr. Sharpe he made that very definite statement that the royalties would run into substantial money and they were definitely going to work in their engineering department to design around it or get other features that they thought would be suitable."

Mr. Ooms: I move to strike the quotation from Mr. Sharpe as hearsay.

The Court: Yes. Strike it.

"Q176. And that was back in 1948, was it?

A. '48. That was the first time.

Q177. You have provided me with a copy of a letter dated November 12, 1954, that seems to bear on that question and I wonder if you would care to read anything from that letter from the Hotpoint Company that you think might bear on this question?

A. Yes. This letter is dated November 12 and signed by Mr. A. G. Hubbard who is their patent counsel. It is a reply to my letter concerning a fluid drive patent, No. 2648213. The substance of it is that they indicate they are changing their design of fluid drive so as not to have it be covered under some of the Castner fluid drive pat-
189 ents of Beam and the pertinent statement, the last paragraph, reads as follows:

'However, it is by this time no secret that we are trying to design out of your patents and thus reduce or eliminate the royalty payments.'

That only reaffirms their action over the period since they took the license and reaffirms the statement of Mr. Sharpe that was made at the time of signing the original agreement.

Q178. And that letter was received in due course at your office when you were in Webster City?

A. Yes, sir.

Mr. Carlsen: I ask the reporter to mark the copy of this letter for the purpose of identification, Plaintiff's Exhibit 33."

Mr. Carlsen: Now, if your Honor please, I offer it in evidence under that designation.

Mr. Ooms: This letter does not mention the sediment trap feature at all as I recall it. I could object to it as irrelevant, but I see no point in making an issue of a
190 document that does not bear on the case. I waive any objection to that letter.

The Court: All right.

(Plaintiff's Exhibit 33 was received in evidence.)

"Q179. Now, are you prepared, Mr. Castner, to give a fairly accurate estimate as to the numbers of washing machines that have been made and sold by your licensees which embodied the sediment trap and discharge tube feature?"

Mr. Ooms: Excuse me. I believe that this is a figure that can be verified by books and records and the witness' estimate would not be the best or acceptable evidence of the statistics. I think we will have to do better than that, Mr. Carlsen.

Mr. Carlsen: Well, it is from this point on, your Honor, that we can omit the testimony which Mr. Castner gives with reference to production figures of his licensees, and that would, I believe, carry through Question 192 on page 61.

Mr. Ooms: I may say I trust the entire deposition will go in for such purposes as we may have to refer to
191 it but I do want to make this point, that this omitted part does not answer the last question which was asked.

Mr. Carlsen: There is no answer to that question.

Mr. Ooms: And that question is, how many sediment trap and discharge tube feature machines have been built. There is no figure on that in the record.

Mr. Carlsen: That is right.

The Court: All right.

Mr. Carlsen: Starting with Question No. 193.

"Q193. Did the Beam Company ever publish any literature for use by the consumer public in connection with the machines that it built?

A. No, with the exception of a few circulars on the Beam name and they were—under the Beam name—and they were made no sales. I would say that there weren't over 500 machines put out under the Beam name. Consequently there was practically no literature. We had no advertising department and operated practically 100% as a contract manufacturer to produce the machines for these volume distributors.

192 Q194. Have your customers and licensees put out literature publicizing the various features that they are licensed under from you and particularly the sediment trap and tube feature?

A. Yes, they have.

Q195. Have you made an effort to gather such advertising matter together?

A. No, for the reason that we were contract manufacturers and did not have any direct contact with the public or with the retailer. We did not ordinarily make any accumulation of materials such as the nationally advertised companies do.

Q196. Well, have you made any effort to gather together any of this material?

A. Well, in a hit and miss way, why, I used to have a

drawer in which I threw in occasional pieces of literature without any sorting of it or classifying it.

Q197. I hand you a folder which I will have marked for identification Plaintiff's Exhibit 34. I hand you this folder which has been marked Plaintiff's Exhibit 34, Mr. Castner, and ask if that contains material of the type you were referring to and if you know where that particular material came from, please so state.

193 A. Yes. These are copies of folders that I referred to and which I had in more or less hit and miss fashion accumulated over a period of years.

Q198. How did they get into that book?

A. Well, I sent them to you and you had them bound up, I guess. Copies made. Had only one copy.

Q199. And you recognize all of these circulars as originals or copies which you provided me with in order that this book could be prepared?

A. Yes. I think these are copies that I supplied to you."

Mr. Carlsen: I would like to have your Honor follow through the description of the material in that book, and I may mention the pages are numbered with rubber stamp that the witness has referred to as sections. I think you will have no trouble.

"Q200. Now, will you please go through this folder, Mr. Castner, and take one item at a time and one section at a time and explain what these circulars show, particularly insofar as they might be of interest in this lawsuit; and where you find any dates, will you please explain those dates or give them.

A. Well, section one is an 8 page folder in color

194 as put out by the Gamble Company dated January 1, 1947.

Q201. Is that the date of the circular?

A. That is a date that's shown on there of a chart contained in the center spread and it is probably the first literature that was put out by the Gamble organization.

Q202. You recognize this particular circular as one that you saw back around about that time?

A. Yes, I do. It was quite a splash at the time with the color and the design of it and everything and the pictures, the initial machine that we put out in the early part of 1947.

In the center spread chart it makes a comparison with what we considered the main automatic washers on the market at that time and it lists basic features including a self-cleaning sediment trap and that chart shows it was incorporated in the Coronada machine and not in any of the other four machines. It is circled with red pencil to pinpoint it.

Just to the right of that chart there is a photograph of the spinner tub and that is circled with red pencil and on the spinner tub it shows the sediment tube.

195 To the extreme right on the fourth page there is a cut-away section entitled 'sediment trap'. This exclusive feature 'The Coronada traps every speck of dirt and grime that settles to the bottom of washer where centrifugal force removes it through escape tubes away from contact with the clothes.'

Q203. Is that an accurate representation of the structure as it was built at that time, Mr. Castner?

A. I would say that that's been retouched by an advertising man and the details are surely not shown clearly there. He has taken some artist's privileges, I would say.

Q204. We go on to the next section.

A. Section two is a 6-page folder in color as put out by the Gamble organization. There is, on the back in the cen-

ter, right near the 'Gamble' the Friendly Store No. 40-5-53 which is a code indicating 40,000 in May, 1953.

Q205. Is that the date you give this circular then, from that indication?

A. Yes. And I would identify the cabinet structure as being of that period, as well.

In the center spread which would be page 3 there is
196 a cut-away section shown marked 'dirt dispenser', in large type. 'When washer goes into spin, heavier sand and dirt are carried to sediment tube out with the water.'

Q206. What is the type of tube used in that illustration?

A. That is the spiral tube as disclosed in the Roth application.

Q207. Roth patent. Do you mean?

A. Yes. The Roth patent.

Q208. Will you take up section three, next?

A. Section three is a 2-page folder put out by the Gamble organization. It is dated January, 1955. This shows several photographs and drawings of salient features and on the first page is circled in red pencil a cut labeled 'self-cleaning sediment trap. All sand and dirt washed from the clothes is trapped in the dirt dispenser. When the washer goes into the spin action, the dirt is discharged by jet action through a jet flow sediment tube with the water. Another patented feature.'

Section four is a 28-page booklet as put out by the Western Auto Supply Company of Kansas City, Missouri, and
197 labeled 'Wizzard Automatic Washer', and it shows on the front page three models of automatic washers as we supplied to them.

On page 6 they describe the machine in detail and the

automatic washing cycle, and listed among the outstanding features is a paragraph in the center of page 7 which is circled with red pencil and which reads as follows:

'Self-cleaning sediment trap. The deluxe automatic has a self-cleaning sediment trap. As the tub spins, water is flushed through the sediment trap out through the connecting spiral tube and with a jet-like action flushes the heavier than water dirt into the outer tub for immediate drainage. It is still advisable, however, to remove the agitator to check for large objects such as pins, coins and so forth.'

Section five is a two-page folder as put out by the AMC, or Associated Merchandising Corporation, the group of department stores I previously referred to. This shows the pictures of the washer and also cuts of salient features. They list on the first page several of the salient features of the washer including one which is marked in red pencil which reads as follows:

198 'Exclusive sediment trap eliminates possibility of sand, silt, and grime in clothes. Automatically self-cleaning through spiral tube.'

Section seven.

Q209. How about six there?

A. Section six is a circular of 2 pages put out by the Firestone Tire & Rubber Company of Akron, Ohio. Front shows a washer and a dryer and on the back there are several illustrations and summaries of salient sales features in the washer including 'sediment trap. Heavy sand and dirt are trapped under the agitator. Prevents contamination of clothes.'

That is circled in red pencil.

Q210. Before you leave that circular, Mr. Castner, that does not necessarily include the tube. Is that correct?

A. That is correct. That was the leader machine that they—

Q211. (interrupting) The what machine?

A. A leader, or low-priced machine.

Section seven is a 2-page folder also by the Firestone Company, which, on the front, shows a picture of their automatic washer and dryer. The back page shows further illustrations and a summary of salient features of
199 the machine including 'Self-cleaning sediment trap. Heavy sand and dirt are trapped under the agitator, then forced through the spiral tube to the outside drain tub. No possible chance of gritty dirt contaminating clothes.'

Q212. Do these Firestone circulars have any dates on them?

A. Yes. I see they both have, on the back page, the symbol 'O. H. 422. Copyright 1954 by Firestone Tire & Rubber Co.'

Section 8 is a tear sheet of a Hotpoint ad showing the 'New 1953 Hotpoint laun-do-et,' and pictures both the automatic washer and dryer. It's an abbreviated ad and under features of the automatic washer it reads as follows:

'It's two washers in one. New two-cycle automatic control. One handles your regular wash, the other handles your delicate modern fabrics safely. Each cycle washes, rinses, spin-dries automatically. Improved throughout with all the features women want most including cycle dial control, deep overflow rinsing, sanitary solid wall tub, sediment ejector.'

Q213. What is the price of that machine quoted as, Mr. Castner?

A. It's $299.95.

200 This does not show the publication from which it was clipped but it does carry May 1953 which would tune in with the copy of the New 1953 Hotpoint.

Section nine is a booklet on laundry technique and a de-

scription of the washer as put out by the Hotpoint Company. The cover page shows a picture of the washer and on page 2 there is a phantom photograph cut away of the washer which shows a sediment trap and the sediment tube among other details. On page 3 circled with red pencil is listed with salied features of the washer Item No. 12 which reads as follows:

'Sediment trap located at bottom of spin tub is self-cleaning. Dirt solids washed out of clothes are collected here and flushed directly into the drain tub, then pumped out the drain with the water from the tub.'

Section ten is a folder in color put out by the Speed Queen Company. This carries a symbol on the back part as 'Form 5021-MM3-54.' Presumably the last three figures are the ordinary symbol as used for dating, meaning March 1954.

The folder, when opened, shows several cuts of both the washer and matching dryer and at the bottom of the
201 page shows six salient features of the washer, the fourth one of which is a photograph of the tub showing the Roth type of ejector tube and circled with red pencil, pinpointed, the copy reads as follows:

'Automatic sediment ejector. All grit or sediment which settles to the bottom of the tub is automatically flushed out through an ejector tube at the beginning of every rinsing cycle. This further helps to turn out a cleaner wash.'

Section eleven is a folder in color that's put out by the Easy Washing Machine Corporation. There are several photos and illustrations including a phantom photograph showing the cut-away section of the complete washer. In there, it shows the sediment trap as well as the spiral ejector tube. To the left of that photograph is another smaller photograph which shows a section of the tub and tube and the copy adjoining reads as follows:

'Sediment rejector. Automatically removes accumulated soil waste from bottom of the tub so that it never touches the clothes. Self-cleaning. Also traps for easy removal heavy foreign objects.'

On the back page of that folder under features, it
202 shows towards the middle of the left column among the salient features, and encircled in red pencil there is one paragraph as follows:

'Sediment rejector automatically removes by jet action accumulated heavy soil from bottom of tub. Self-cleaning.'

Section 12 is also a folder in color as put out by the Easy Company. There is a blown-up photograph of the automatic washer along with some other photographs showing salient features. At the lower right there's a photograph of the spin tub showing the Roth type of ejector tube and the sediment trap. The copy along side of that reads as follows:

'Jet action sediment rejector, automatically removes accumulated soil waste from bottom of tub so that it never touches the clothes. Self-cleaning.'

I don't see any date on that but the design indicates 1953.

Q214. Now, to what extent, if any, or if you know, has the defendant in this case publicized the sediment trap feature that we hear accused of being infringed on?

A. Well, they have shown it in some of their copy. As I recall it, it was first in their announcement folder.
203 It has not been persistently advertised to my recollection."

Mr. Carlsen: Before we continue, I would like to offer in evidence a booklet which has been marked Plaintiff's Exhibit 34, which your Honor has in his hand.

Mr. Ooms: No objection.

The Court: It may be received.

(Plaintiff's Exhibit 34 was received in evidence.)

"Q215. I show you what has been marked for identification Plaintiff's Exhibit No. 34"—

Mr. Carlsen: That should be No. 35.

Mr. Ooms: I agree.

"Q215. (continuing) ---and ask you if you can state which this is, where it came from, what it shows?

A. Well, this is a front page. Apparently, a house organ of the Norge Company. It's headed, Norge News, and is dated June, 1951.

Q216. Where did this particular piece of paper come from, Mr. Castner?

A. Well, I think that was one of those stray pieces of literature that I accumulated. Now, just where I got it, I don't recall.

Q217. You have given it to me recently. Is that
204 right?

A. That's right. Page 2, the upper half of the page in large type; 'New addition to Norge line. First showing of amazing new item line, automatic washers.'

They have a photograph of their washer and among the features they describe of this amazing washer they devote a paragraph which is encircled with red pencil and reads as follows:

'To assure the removal of sand, grit and other heavier-than-water particles Norge has included a ring of small openings in the bottom of the wash tub through which grit is forced out during the very rapid spin.'

Q218. Does that date of June, 1951, have any particular significance to you?

A. Well, that was our first specific word about the Norge automatic. We had heard they were coming out with one and it ties in with a letter that I wrote to Mr. Ardis at

the Herrin, Illinois, automatic washing machine factory. I might state that where things were moving in the automatic washer field we endeavored at all times to keep up with it and have for testing in our laboratory a
205 sample of all machines and there's a courtesy among the various washer manufacturers. We would normally just write to them to get a machine. In that case, I did just that and wrote to Mr. Ardis telling him I had noted they were out with their new machine and would appreciate it if he would supply us one and bill us for it, which he did.

Q219. Have you run across any other advertisements of the defendant in this case, Mr. Castner, that deals with or touches on the subject of sediment removal?

A. Yes. I run across that in a Norge ad in, I think, the February issue of Life which I referred to you.

Q220. I have here a September, 1955, issue of Life magazine. Would that be the one you refer to? Or is that another one?

A. I don't remember for sure. Yes. This is one of those ads.

Q221. Now, you are looking at what?

A. I am looking at a 2-page spread in color in the Life issue of September 19, 1955. It shows a picture of their washer and also three other pictures of parts of the machine. In the lower left-hand corner they list five features, which features and heading read as follows:

206 'Norge automatic first. Dual cycle changes wash action to fit the fabric automatically. Multi rinse changes from mist spray to tidal wave automatically. Time line control starts, stops, repeats, automatically. Sediment remover, water temperature controls all work automatically. Buzzer signals completion of washing cycle. Automatic.'

Q222. Have you seen other ads similar to the one you have just testified about?

A. Yes, I have.

Mr. Ooms: What page is that?

Mr. Carlsen: Pages 150, 151. We have had to write them in because they weren't printed.

I would like to have those two pages marked for identification as Plaintiff's Exhibit 36 and I assume it will be agreeable with you, Mr. Ooms, that we did not include the entire magazine, but merely those two pages? You will agree those two pages appear in Life for September 19, 1955?

Mr. Ooms: As far as I know. It's the first time I have seen it. It's agreeable that only the two pages referred to by the witness need be put in evidence.

207 A. I have seen some folders on various automatic washers in their 1956 lines and included in there are six folders describing six 1956 washers of Norge in their features they show on all six of them the following:

'Built-in sediment remover. Automatically removes sand and sediment so they cannot recirculate through the clothes.'

Q223. What are you reading from now, Mr. Castner?

A. I am reading from these Norge folders that are in this.

Q224. Where did they come from and where did you get them?

A. Well, this is a specific book as put out by the American Home Laundry Manufacturers Association.

Q225. As of what time?

A. As of 1956. Covering the 1956 models and some of the literature that I received as an honorary lifetime member of the association."

Mr. Carlsen: At this time I offer in evidence the exhibits that have been marked for identification as Plaintiff's Exhibits 34, 35 and 36.

208 Mr. Ooms: No objection, your Honor.

The Court: They may be received in evidence.

(Plaintiff's Exhibits 34, 35 and 36 were received in evidence.)

"Q226. What is that newspaper, apparently, or something you have in your hand there?

A. Oh. That was an ad covering the 1956 Norge washer. It's dated Sunday, November 13, 1955. The Milwaukee Journal. The heading reads, ''56 Norge washer with super rinse has five separate purifying actions,' and they have some Walt Disney type of five illustrations, No. 5 of which reads as follows under the illustration: 'Automatic dirt disposal. Heavy particles are trapped at bottom of tub and ejected automatically during final rinse.'

Q227. Where did you get that particular tear sheet?

A. I don't remember just where that came from.

Q228. Were you in Milwaukee at that time or were you down here?

A. Wait a minute. November 13? Yes. I was in Milwaukee. I was up north and I was in Milwaukee to get over to Dellafield to trail that sailboat back.

Q229. Now, this then is an advertisement by the
209 dealers of Norge washing machines. Is that correct? The retail outlets?

A. That's correct. It looks like it is an ad that was put out by maybe the Norge distributor serving the dealers that are listed, and there are some 25 or so dealers listed that all have addresses in Milwaukee or the Milwaukee trade territory.

Mr. Carlsen: I will ask the reporter to mark this advertisement for identification as Plaintiff's Exhibit 37."

Mr. Carlsen: At this time I offer in evidence Plaintiff's Exhibit 37.

Mr. Ooms: No objection, your Honor.

The Court: It may be received.

(Plaintiff's Exhibit 37 was received in evidence.)

"Q230. Yesterday, Mr. Castner, you gave considerable testimony in connection with production and royalty figures for which I believe you stated information came from the home office in Webster City?

A. Yes, sir.

Q231. Did you, yourself, actually compile those figures or did someone else?

210 A. No. Those figures were compiled by Charles Cummings. He was assistant secretary and comptroller of the Beam Division of Solar and had charge of all the office accounting and records of all kinds.

Q232. And were these figures then prepared by him from original records that he had in his control?

A. That's right. He's the custodian of all those records. All those license agreements records were considered fairly confidential and he had those right in his own office.

Q233. Is Mr. Cummings still with the Beam Company in Webster City?

A. Yes. He's with the new company, the new Beam Company that took over last July.

Q234. And do you know whether or not he still has all the original records from which your figures were taken?

A. Well, I assume that he has, yes, although his records were left right there.

Q235. As far as you know, are those records still available?

A. I think they are.

Q236. Subsequent to the compiling of advertisements which have been marked Plaintiff's Exhibit 34, have

211 you come across any other advertisements by your

licensees that might be of interest in connection with this lawsuit?

A. Yes. I came across these Hotpoint ads showing a super deluxe machine in which they have an illustration of this spin tub and the sediment tube and so forth. I ran across that in the contractor's office. I am building another home, and, picking out a Hotpoint dishwasher and built-in oven and surface plates and so forth and I turned over the washer section and I noticed that circular.

Q237. Is this circular which I hand you which has been marked Plaintiff's Exhibit 38 one of those circulars?

A. Yes, sir.

Q238. Now, what does this circular show that might be of interest in this case, Mr. Castner?

A. Well, I think on the back page where it lists the specifications and they call their super deluxe machine, it shows also, they consider basic features of merit, and in that they show four such basic features of merit. Their push button control; their rubber finned agitator; their deep overflow rinse; and their automatic sediment swirl out. The cut in the lower right-hand corner of the back page shows a cut away of their automatic sediment swirl out showing how the water is flushed out through the sediment tube and the copy under that cut reads as follows:

212

'Automatic swirl out. Particles of soil and sand are trapped at the bottom of the tub and swirled out automatically. There are no attachments or accessories to remove, clean and replace. It's all automatic.'

And then underneath that, which happens to be the extreme lower right-hand corner, it shows, '100,000 printed in USA.'

Q239. Would that indicate to you that 100,000 of these had been actually printed and distributed?

A. Yes, sir.

Q240. Is there any date?

A. Or at least, they were printed and available for distribution.

Q241. Is there any date on the circular?

A. I do not see any date but it is there, Model LK-11, which is their new 1956.

Q242. I call your attention to the lower left-hand corner.

A. Oh, yes.

213 Q243. On the back of the circular.

A. Yes. In the lower corner, it's coded, '10-55' which would indicate that these were made up and printed in October, 1955.

Q244. And you picked up one of these circulars when?

A. That was, I think, in the early part of January when I was selecting our items for this new home we are building.

Q245. January of this year?

A. Yes, sir.

Q246. So what would this circular indicate then to you that Hotpoint was selling machines, at least of one model, that carried the ejector tube and the sediment trap?

Mr. Ooms: I object to the question as leading and also as calling for a guess of the witness rather than specific knowledge which is available from other witnesses.

Mr. Carlsen: I will reframe the question.

Q247. Do you know, then, that as of the time you found this circular that the Hotpoint Company was advertising and selling a machine having the features shown

214 in this circular?

A. The fact that they were distributing it to such people as I encountered and it was open for selection if I would have ordered one of those like I ordered the oven

and the dishwasher, I think that doubtless I would assume there that it would be sold.

Mr. Ooms: I move that that answer be stricken on the same grounds that I made the previous motion, objecting to the question as calling for a hearsay and merely speculation on the part of the witness."

Mr. Carlsen: Your Honor, I believe we have already stipulated that circulars may be introduced by either party where they are dated, or where they have some in .gnia, as I assume there would be no occasion to introduce them otherwise. Now, no one like Hotpoint distributes or prints 100,000 circulars unless they are intended to be delivered to the purchasing public, and I believe the Court could well take judicial notice of that fact, without having to establish that sort of thing by records.

215 Mr. Ooms: We did have an agreement we can use certain things, but I raise this question: While the circular and its printing, just as Plaintiff's Exhibit 34, will show what did appear in a certain publication, that still is not evidence of the contents. This man says, "I assume from those if I ordered one of those like I ordered the oven and the dishwasher, I think that doubtless I would assume there that it would be sold." Now, I don't think that is an answer to the question.

The Court: I think your point is well taken.

Mr. Ooms: Thank you.

"Q248. Did you pick up this circular as a prospective purchaser or because you were interested in this lawsuit?

A. I picked it up because I was interested in the Hotpoint appliances that were being offered to me for use in my home. My immediate object was the selection, like I mentioned, of an oven and surface plates and dishwasher.

Q249. But these circulars were and are available to any

one interested in the Hotpoint automatic washers,
216 are they not?

A. Absolutely. They were available to me.

Q250. You have testified to the effect that in the various licenses that have been granted to Hotpoint, to such companies as Hotpoint, Easy and Speed Queen, there are a number of patents and applications that are directed to three general features. Is that correct?

A. Yes, sir.

Q251. One of those features is the sediment disposal?

A. Yes, sir.

Q252. And one, the vibration snubber? Vibrations snubbing feature?

A. Yes.

Q253. And another has to do with the transmission of power from the motor to the tub and the agitator. Is that correct?

A. Yes, sir.

Q254. Do you know whether or not your licensees have at all times used the snubbing feature and the transmission features that are covered by the various patents in these licenses?

A. No. There's no positive check that they have
217 on them. As a matter of policy those licensees do not disclose to us the details of their plans and their engineering changes that they make. They are kind of jealous of little or big changes that give them a different sales approach and they definitely do try to have things just a little different, even though the fundamental thing might be the same, so that they can develop a little different sales approach and not be paralleling identically the copy and so on that the Beam production might incorporate in their machines so that they actually refrain from showing us much of what they are doing.

Q255. My point was, Mr. Castner, however, do you know as a matter of fact that they have at all times, or even currently used, for instance, the specific snubbing arrangement that your patents cover?

A. No, sir, I do not know."

The Court: We will recess until 2:00 o'clock here.

(Whereupon a recess was taken to 2:00 o'clock p.m. of this day, April 24, 1956.)

* * * * *

219 DEPOSITION OF GEORGE P. CASTNER
(Continued)

(Direct Examination (continued).

Mr. Carlsen: I believe we left off at Question 256.

"Q256. Would that also be true with reference to the power transmission devices?

A. That's correct

Q257. But you do know that they must use at least one or two of these features or they wouldn't be taking royalties. Is that correct?

A. That's correct. They must be using at least two of them because they are all paying their full royalty.

Q258. Well, under such circumstances is it at all possible to accurately estimate the royalty earning value of the sediment trap patents as compared with the others?

Mr. Ooms: Object to that question as leading. The information can be procured. There is no question about it. And, to ask this man to estimate that is completely lacking in probative force.

220 Mr. Carlsen: Merely asking him if it's possible to estimate those relative values in the light of the fact that they do not obtain accurate information as to all of

these particular features, and I think the witness is capable of answering that question.

Mr. Ooms: I make the same objection."

The Court: He may answer.

"A. No. It would not be. The only measure might be in the prominence of the advertising of those three respective features.

Q259. Will you elaborate on that a little more, Mr. Castner? I don't know just what you have in mind there.

A. Well, ordinarily, in their advertising sales story they list what they consider sales features of merit that will appear to the prospective buyer and in many of the circulars they do show sediment traps and I think that that would occupy a more prominent spot than anything that had to do with the snubbing or the transmission.

Q260. In other words, is it your observation that the sediment trap feature has been stressed as much, or at least equally as much, as the other features in the 221 advertisements of the licensees?

Mr. Ooms: Object to that question as leading and calling for a comparison of documents which speak for themselves."

The Court: Objection sustained.

"Q261. Have you reviewed the advertisements appearing, for instance in the Plaintiff's Exhibit 34, Mr. Castner, with a view to determining whether or not the sediment trap feature is stressed any more or less than the other two features that you speak of?

A. Well, section one of that folder of Exhibit 34 features the sediment trap and the fluid drive which would be considered the transmission part.

In section two, they feature the three items, the transmission being under 'floating power'.

In section three, they also feature the three basis features.

In section four, on pages 6 and 7 they feature only the sediment trap out of those three items.

In section five, they feature only the sediment trap and the transmission in the form of the fluid drive.

222 In section six, they feature only the sediment trap and the transmission in the form of a fluid drive.

In section seven, they feature only the sediment trap and the fluid drive in the form of a transmission.

In section eight, they feature only the sediment ejector.

Q262. That is the Hotpoint advertisement?

A. Yes, sir.

Q263. Will you identify those advertisements as you go through them by name?

A. Section eight, the Hotpoint ad, features only the sediment ejector out of those three basic features.

Section nine is a Hotpoint folder, features only the sediment trap and the fluid drive transmission out of those three basic features.

Section ten is a Speed Queen folder and features only the sediment ejector and the fluid drive of those three basic features.

Section 11 is an Easy folder and features only the two items, the sediment ejector and the fluid drive, out of those three items.

223 Section 12 is also an Easy folder and that features only the sediment ejector and the fluid drive of those three basic features.

Q264. You have made some reference to the fact that in washing machines sold by the Beam Company to its various customers as well as some of the washing machines sold by the various licensees the ejector tube has been omitted. Is that correct?

A. Yes, sir.

Q265. I believe you also testified that at least one of the companies, the Easy Company, had used the ejector tube on all of its production?

A. That's what they so stated in their letter.

Q266. And insofar as the overall Beam production is concerned can you give an estimate or any figures as to the actual percentage of machines that were sold without the tube?

A. The Beam figures are accurate through '54 and with the projection that I outlined for '55 it figured out right at 12½% in the overall production of Beam.

Q267. And Hotpoint has refused to give you any figures on that. Is that correct?

A. That's correct. As they stated in their letter.

224 Q268. Now, from the facts as you know them and from the statistics that you do have would you care to give an estimate as to the total number of machines or per cent of machines that have been sold up to the present time by the Beam Company and its licensees which had the sediment trap but not the ejector tube?

Mr. Ooms: Objected to as asking for an estimate when the records are readily available and through the records of the Beam Company and the royalty reports by their licensees."

The Court: Objection sustained.

Mr. Carlsen: Question 270.

"Q270. Now, I get back to your activities a little with the Norge Company at about the time you first saw their advertisement of a sediment ejector in, I think you said, June of 1951.

What did you do about the matter at that time, if anything?

A. Well, I mentioned yesterday that we try to keep up with all new machines and developments and I wrote to Mr. Ardis whom I had known for a considerable period of time He is manager of their washing machine factory at Herrin, Ill.

225 Q271. Manager of Norge's washing machine factory?

A. Yes, sir. And asked him for a machine and, to bill us for it, which is a courtesy that manufacturers of washers ordinarily extend to each other.

Q272. And do you recall when you wrote to Mr. Ardis, or do you have any record of that?

A. I have a file if I can refer to that.

Q273. You can refer to any files or records or memoranda you may have.

A. Well, I wrote to Mr. Ardis on June 25 in which I asked him to kindly ship us one of their new washers.

Q274. You are speaking of June 25, 1951, now?

A. Yes, sir. He replied July 16, they were shipping us one.

Q275. I would like to have you go through that file there, Mr. Castner, that you can briefly state just what happened on various dates without reading too much from the record.

A. Well, on August 10, 1951, I wrote to Mr. Ardis giving him comments about the merits of his washer in accordance with what he had asked of me. I also told him that we felt that the sediment trap feature interested us very much.

226 We think your snubbing is very effective and we did take that up with our patent attorney to get his opinion as to the patent claims being allowed, also to get an expression from him in regard to the disposal of the

sediment. We had an impression that there might be some overlapping on the latter construction as compared to our own. He has expressed an opinion that your sediment trap varies as to detail as compared to our own but that the basic construction is similar. He pointed to the file wrapper in the history of prosecution of our patent in that we were not going to be allowed any claims were it not for the fact that we demonstrated we got a segregation of the water so that part of the water, or the main body of it, climbed up the tapered walls and a portion of it was carried away in the other direction through a recess in the bottom of the tub and through a tube. The way he expressed it was that, while your construction varies in detail, it is only the same thing as if you put a screen over our construction.'

Q276. What happened after that, Mr. Castner?

A. On August 19, I received a reply from Mr. Ardis, August 29, 1951, in which letter he wrote:

227 'Your comments with respect to the patent situation are of interest and I have sent a copy of your letter to our patent attorney, Mr. Joseph M. Gartner, Borg-Warner Corporation, 310 South Michigan Avenue, Chicago 4, Illinois, for consideration'. Because of the apparent uncertainty as to what may be determined patentable subject matter by the patent office in Washington, with respect to any of your pending patent applications and our pending applications it would appear to be premature to determine questions of infringement. Accordingly I would appreciate your holding this matter in abeyance until we have had an opportunity to further analyze this situation and at least until I have had the benefit of our patent attorney's review of this situation.'

By December 26, 1951, I had had no word from h and I sent him a reminder to that effect.

On December 31, 1951, he acknowledged my letter of the 26th and stated, 'As a matter of fact, I have not yet had the opinion of our attorneys on this matter. However, I have asked them to give us information on this as quickly as possible. I will follow this and write you again soon.'

228 On January 9 I again wrote Mr. Ardis, 'Furthering our discussion in Chicago about the sediment trap patent situation I am attaching copy of my letter to Gearhardt,' (he is their Norge chief engineer) 'in which you will note I have sent him a copy of this patent, namely Castner Patent No. 2470140 issued May 17, 1949. I think your suggestion of getting together possibly in Chicago with our respective patent attorneys is a very good one and we will await your advice as to confirming date.'

Mr. Ardis acknowledged my letter on January 11 stating he was sending that copy of patent to the Patent Department and to confer with us as quickly as possible.

On March 28 I again wrote Mr. Ardis as follows:

'Our folks are pressing me to find out what finally developed in connection with our correspondence regarding a sediment trap which you have in your washer. I would appreciate hearing from you as to whether or not you are desirous of holding a meeting in combination with our patent attorneys such as you have previously suggested.'

229 On April 10, 1952, Mr. Ardis acknowledged that letter of mine and stated he had been unable to get an answer for me because Mr. Stallings, their general patent counsel, had been ill and that he was expected back in two weeks and he would get the information for me at that time. He said in the meantime, if I would care to talk to Mr. Joe Gartner of their patent department we might follow through with that.

I wrote on April 22, 1952:

'I followed through with our patent attorney in accordance with the suggestion contained in your letter of April 10 and have arranged for Mr. Carlsen, our attorney, to meet with Mr. Gartner at your Chicago office next Tuesday, April 29.'

Q277. Was that conference held then, Mr. Castner?

A. Yes. That meeting was held.

Q278. You recall who was present?

A. Yes. Mr. Stallings was present at the meeting along with Mr. Gartner.

Q279. Were you and your attorney present?

A. Yes. Along with you and myself.

There's a wire that I sent to Mr. Stallings on June 24, 1953:

'Mr. Carlsen and I will be at your office Thursday, this week, 9:30 a.m.'

Q280. Was that second conference held in Chicago?

230 A. Yes. I do not have the date of that second conference. I have a letter, July 15, that I wrote to Mr. Stallings as follows:

'Since our visit with you in Chicago Mr. Carlsen and I have gotten together with our general counsel and others interested and have carefully given consideration to all of the various approaches that we discussed with you and Messrs. Gartner and Motley. I am attaching a copy of Mr. Carlsen's letter dated July 11 which I think pretty well covers the nature of the discussions that we had and our conclusions in connection therewith. As indicated in Mr. Carlsen's letter our only conclusions are that we have a good patent, that your present, as well as your proposed, construction would infringe our present patent as well as expected claims in a more recent application. You can see

from Mr. Carlsen's letter that in the event you wanted to come in under a license we would not be able to do anything different than the regular license terms as described to you.'

Q281. Do you recall whether or not at one or both and at any of these conferences, you offered Borg-Warner a license under that patent or these patents?

231. A. Yes. I do recall.

Q282. Do you recall to what extent the terms for such a license were discussed?

A. It was explained to Mr. Stallings and his associates that our regular license agreement covered three basic features, sediment trap, transmission incorporating the fluid drive, and our snubbing means, and a license incorporating those basic features would be 1% of their factory billing price. In their case, if they wanted a license covering only one feature, namely the sediment trap, in accordance with the terms of our regular license agreement it would be one-half of one per cent of the factory billing price. I explained further that these royalty rates were on a sliding scale basis so that ultimately, that one-half of one per cent would be reduced to three-tenths of one per cent. There were other terms and conditions in the license agreement that were fairly standard but the basic features were as outlined to him.

Mr. Stallings had a note pad and pencil and as I described the basic features of our license agreement he was rapidly writing and noting those details as I described them to him.

Q283. Did you ever offer them or present a formal
232 agreement in the form of a typewritten document?

A. No. I did not because I felt that we were so far apart in what he considered a reasonably royalty charge.

He was talking something like ten or fifteen cents. Whereas the formula that I outlined to him would have resulted in probably 70 cents at the start and ultimately 35 or 40 cents when they got into volume and as long as could not have any meeting of the minds on the basic features I didn't think it was appropriate to submit a license agreement because, in all my experience in negotiating any kind of agreements, you generally have to have some meeting of the minds on the salient points before you dress it down to any kind of a written agreement.

Q284. Prior to 1951 had you ever had any other contact with Borg-Warner in connection with patent problems of any nature?

A. Yes, we did.

Q285. When was that and what was the situation?

A. That was back starting back in 1945, if I can look at the file.

Q286. Would you just very briefly state what that situation was?"

233 Mr. Ooms: I made an objection, your Honor, but I am willing to withdraw it.

The Court: All right.

"A. In 1945 approximately in June, a Mr. Chet Houseneck was in the employ of Norge and phoned me and then came out to Webster City in regard to building a transmission for them for their conventional wringer type washer line and that visit, the substance of it was, we did not have adequate machine and production facilities to take on any such production, particularly where it might be on a temporary basis. He proposed that they could buy the necessary equipment, gear cutters and so forth, which we again turned down. We had a transmission that they were very much interested in because of its efficiency and low cost. This

transmission was one that was the property of an individual, Alan Patch of Ripon, Wisconsin.

Q287. You mean by that that Mr. Patch had a patent on that particular transmission?

A. Yes. Covered by a Patch patent, No. 1964440. Under our license agreement with Patch we had exclusive use in certain merchandising areas which would be in con-
234 flict with the use intended by Norge. There were subsequent letters of correspondence, phone calls and finally a visit by Mr. Stallings to our factory on December 5, 1945 which resulted in us agreeing to grant a sub-license to the Norge Company subject to approval from Mr. Patch. This was later obtained and the license agreement was entered into.

Q288. Is that the same Patch that you referred to yesterday in connection with some other testimony? You made reference to a Patch license agreement that you had?

A. Yes.

Q289. Now, I want to get back to the Hotpoint agreement for just a minute. I believe you stated that—"

Mr. Ooms: I withdraw the next objection also.

The Court: All right.

"Q290. When testifying about the Hotpoint agreement, Mr. Castner, you stated I believe, that General Electric had the right to use any of these features they wanted to?

A. That's right, sir.

Q291. I believe you also stated that the General Electric washing machine has never adopted the sedi-
235 ment trap feature. Is that correct?

A. Yes, sir.

Q292. So that General Electric Company has never taken any, or paid any, royalties under a license for having to do with your patent?

A. That's correct.

Q293. Do you know why they have not adopted any of your features?"

Mr. Ooms: I object to that question unless he has some written correspondence from them or some official statement on their part.

The Court: Sustained.

Mr. Carlsen: Question 297.

"Q297. You referred to some letters yesterday signed by Mr. Hubbard. Who is he?

A. He is the patent counsel of Hotpoint Company and is a resident counsel that puts in his full time with the Hotpoint Company.

Q298. Now, prior to the first Hotpoint license agreement was any investigation of the patent situation made by Mr. Hubbard or by the Hotpoint Company or by General Electric?

A. Yes. There was an investigation because
236 the original agreement, license agreement with Hotpoint, was made before any patents had issued. They brought in a Mr. Biggs from the Patent Department of General Electric Company at Schenectady and he sat in and finally either drew up the draft or was the one that made the final approval of that license agreement and, as I stated there, it covered the applications, copies of which we gave them along with authority to contact the patent department.

Q299. You mean the patent office?

A. The patent office in Washington, as I recall it.

Q300. Did Mr. Biggs complete an investigation of those patent files?

A. He completed the investigation and, on his recommendation, the agreement was entered into because he

stated that there were features that were new and novel and he felt sure that patents would issue.

Mr. Ooms: Objected again and move to strike the statement of what Mr. Biggs said as purely hearsay."

The Court: Strike it.

"Q301. In any event it was Mr. Biggs and his de-
237 partment who finally approved the license agree-
ment that was made between Solar Corporation and Hotpoint, Inc., is that correct?

Mr. Ooms: I object to that as leading and also asking for facts beyond this witness' knowledge. He can't know what went on in the internal departments of General Electric Corporation."

The Court: Objection sustained.

Mr. Carlsen: Question 303.

"Q303. In the complaint in this case, as you may remember, Mr. Castner, it is alleged that the Solar Corporation had invested substantial or large sums of money in connection with the development of the inventions here in suit and I am wondering, do you have any figures available? Do you have any of the facts to support that contention and if so, would you kindly briefly discuss that?

A I don't have any tabulated figures but, for several years there before I left Beam, why, we were spending between $7,500 and $10,000 a month on our engineering development department and in any changes made in our
design, such as, we changed the balance spring and
238 the tab, it involved changes in the sediment trap
or experimenting with it. Originally, the figure that we had on our books for development at the time these patents were filed was a figure of $124,000.00, a substantial portion of which would have been in this sediment trap. So that, including that original development

and subsequent development on it, why, it would, I would estimate it could easily be $50,000.00.

Q304. You mean by that that $50,000.00 was the total amount? Would be a reasonable amount to allocate towards this particular development?

A. In the sediment trap and tube.

Q305. Now except for the defendant in this case have you at any time been troubled by what you would consider infringers, other infringers of patents here in this suit?

A. No, sir. We have never had any other manufacturer use any of the devices in a manner that we felt infringed them. They have been respected by other members in the industry."

Mr. Carlsen: The next question, your Honor, is one that I will not ask the witness. It has been objected to, and rather than get into any discussion over that, we will omit it. That concludes the direct examination.

239

We only have in addition to offer Plaintiff's Exhibits 37 and 38, which have previously been referred to, one being the Milwaukee Journal advertisement, and Plaintiff's Exhibit 38 being a Hotpoint circular, which I now offer in evidence as Plaintiff's Exhibits under those designations.

Mr. Ooms: No objection.

The Court: They may be received.

(Plaintiff's Exhibits 37 and 38 were received in evidence.)

Mr. Carlsen: I may add at this time that in connection with the Plaintiff's Exhibit 33, Mr. Ooms did offer an objection previously, and that was that the previous letter to which it referred had not been produced. We subsequently did produce it, and marked it for exhibit in evidence as Plaintiff's Exhibit 33.

Mr. Ooms: I have no objection to it if he wants to put it in.

Mr. Carlsen: I say, we will not put it in unless you want it in.

240 Mr. Ooms: No.

Your Honor, I could read this cross examination, but I think if we went ahead, and I put it in as part of my case, or such parts as I should read, I could probably save time, because I might whittle it down and use only such parts as I thought pertinent to what developed in the case. If counsel is prepared to go ahead on other matters, I would prefer to do it that way because I have another witness here tomorrow that I would like to get out of here.

Mr. Carlsen: That is agreeable.

Mr. Ooms: Can you go ahead then?

Mr. Carlsen: Yes.

Mr. Ooms: If that is agreeable to your Honor?

The Court: Yes.

241 RALPH L. DUGGER, called as a witness on the part of the plaintiff, being first duly sworn, testified as follows:

The Court: What is your name?

The Witness: Ralph L. Dugger.

The Court: Where do you live?

The Witness: Box 73, Route 1, Hopkins, Minnesota.

The Court: What is your business?

The Witness: Patent lawyer. Also I have several side businesses. I am president of two corporations.

The Court: You may proceed.

Direct Examination by Mr. Carlsen.

Q. Mr. Dugger, will you please state your background of education and experience that qualify you to give expert testimony in this case?

A. I attended the University of Illinois, graduating in 1926, bachelor of science in electrical engineering; thereafter was employed beginning—I was actually with Westinghouse Company first during the summer of 1925; resumed employment with them after graduating from the
242 University of Illinois, and continued in their employment until about July, as I remember it, 1927; and while so employed at Westinghouse continued postgraduate study at Carnegie Tech, mostly in special courses having to do with machine design, lubrication, and some stress analysis.

I then took the civil service examination, and entered the employment at the United States Patent Office in Washington, D. C., in midsummer, 1927, and continued in the United States Patent Office first as an assistant examiner and later as an assistant interference examiner until May of 1934.

After leaving the United States Patent Office I was employed by a law firm in New York City until October of 1937 when I changed employment and went to Minneapolis to the firm that was then known as Paul, Paul & Moore; and I have since that time been with that firm, first as an employee, and now as a firm member.

During the latter few years I have engaged in other activities, which have to do with real estate properties, aircraft hangars, particularly, and the manufacturing
243 of components for them.

While in Washington I attended the George Washington University from 1927 to 1931, graduating in 1931 with an LL. B. degree. I took and passed the bar examination in Washington in 1930, and was admitted to the bar in Washington in that year, and the following year in the Federal Court, in the Court of Customs and Patent Ap-

peals and the Bar of the Supreme Court. During my employment at New York I again took the bar examination, and was admitted to practice in New York State; and have since, of course, been admitted by motion in the State of Minnesota.

Q. Have you had any particular experience in laundry machinery or centrifuging problems?

A. In connection with my work in Minneapolis particularly, I have since 1937 had the responsibility for the work of the Unipress Company, which is a manufacturer of laundry machinery, and also the work of Midland Laundry Machinery Company. I have a fair familiarity with that type of equipment, which does include washing machines and also extractors, as they are known. They are mostly in the industrial field, however.

244 Q. What have you done by way of specific preparation for this case, Mr. Dugger?

A. I have examined and operated the defendant's and plaintiff's machines. I also studied the snop drawings of the defendant's machines, which I believe were furnished to you. I have studied the file wrappers of the patents in suit. I have analyzed the claims of the patents in suit. I prepared, or had prepared, some charts, which will be used for showing how the claims apply to the accused structures.

Q. Will you now take a copy of the original Castner patent in suit, No. 2,470,140, and tell the Court what it discloses, with particular reference to the subject matter covered by claims 1, 4 and 5 here in suit?

Mr. Carlsen: Do you have copies of the patents, your Honor?

The Court: I have copies of the Castner patents and the other patent.

By Mr. Carlsen:

Q. Do you have some other chart you prefer to work from, Mr. Dugger?

245 The Witness: Your Honor, I work both from the small copy and the larger chart.

Mr. Carlsen: Probably you can find the one you want to work from.

The Witness: I thought I had a larger chart, but it is the one I have used for the claims. So, I will just go ahead with the small copy.

The Court: All right. Which one are you referring to?

The Witness: Two Castner patents, your Honor, the original and the reissue, and to simplify the discussion I will first make a comparison of them in so far as their disclosures are concerned.

By Mr. Carlsen:

Q. Proceed, please.

A. Referring to the reissue Castner patent, it has been the practice in the Patent Office in more recent years that when a patent is reissued and there is any change made in the specification or the claims to print what is new in italics, and to show what was taken out, if any, by bold faced type in brackets.

246 Referring to the specification of the reissue patent, you will notice that in column 3 there is an italicized paragraph, and in column 5, down toward about—well, it is at line 53—there is a numeral 37 with rather heavy brackets around it, and the numeral 32 in italics alongside of it, meaning 37 was taken out and 32 put in; and the italicized paragraph in column 3, which is at line 56, was added in the reissue patent.

Now, in so far as the figures and the drawings are concerned, these are identical. The same figures are used. There are five of them on two sheets.

Therefore, the disclosures of these two patents are identical, with the exception of the italicized paragraph in column 3, which, as I will point out later, after I have explained the patents, is simply a statement of what is shown in the original disclosures.

Now, therefore, referring to the drawings of the original Castner patent and to its disclosures, which are therefore the same as the disclosures of the reissue, I will begin
247 my explanation of the construction.

Referring to Figure 1, there is at the bottom of Figure 1 a portion which bears the legend "A" the designation "A". These are capital letters unless otherwise stated. That is the base of the machine, and on top of it sets a container, numeral B, which appears in the upper left-hand corner of the picture Figure 1. That is the top casing, and it is a liquid-containing casing.

You will notice that the bottom is raised a little bit in the middle, and that is a collar 40 that comes up, and it is flanged out a little bit. That is so that the mechanism from the base can reach up through the collar and, yet, any liquid that is spilled into the casing will be kept from dripping down, and liquid will run around to one point, which is the drain 42, where the liquid goes out.

The casing B, of course, has a top on it with an opening 44 that is flanged downwardly so as to present a smooth edge.

In the base there is a central frame 11 which sticks
248 up through the collar and it is on this central frame that there is supported a tub C, also in the upper left hand corner of Figure 1.

The tub as a whole is composed of several elements. There is a base element 17. The base is somewhat thicker material, and it has a central conical part 18, which has a

flat portion about the top where the cone comes up, and there are some cap screws 20 that reach down and fasten onto the flange of the rotatable element 22.

Then above the screws 20 there is a tubular portion 19, or spindle, which sticks up and goes up, well up, into the agitator. The reason why this goes up is because it has to be above the water level in the machine.

Now, that conical portion in the base reaches down and then there is a horizontal part which is the part to which the leader on numeral 17, where it runs up there is a horizontal portion there, and that horizontal portion has a rim around the outside. It is rather thick and can be observed in Figure 1, but perhaps a little better in Figures 2 and 3. The rim is given a numeral 16 in the specification, and I will allude to it later on to show what kind of a
249 shape it is made in. That is observed in Figures 4 and 5. I will come back to that.

For the moment, note that the rim has a flat top surface. It forms a surface to which there can be attached the bottom part of a thinner tub member which is fastened to the rim by a plurality of screws 15.

This thinner tub member starts at the rim; it extends straight out flat across the top of the rim, and then rises in different slants, but always rising, along the portion 14, and then curves on out so as to form a dished bottom; and then at about the level of the section line 55, it begins a uniformly extending diameter, rising to above the baffle 45; and there are some flutes in the outer part of this which reach out and terminate at the openings 36. Now, that is the effective top diameter of the tub, because the water can flow out through those openings. Above this point the tub curves in a little bit and has a smooth rolled edge 13.

Now, that portion of the tub is fastened onto the base 17,

which also forms a part of the tub, by a ring that
250 has the numeral 29 on it This rim can be seen probably best in Figures 2 and 3. The upper surface of it slants down so as to form a smooth connecting edge with the surface of the sheet metal upper member 12, 14 of the tub. I used two designations 12, 14, on that upper member, because they are different parts of the same thing. 12 is the upper wall, and 14 is the dished bottom, and they blend right into the upper surface of the ring 29. That ring is seated upon some gaskets and then screws pass through the ring and through the gaskets and down into the rim 16, so that it clamps the whole thing together.

Now, the specification describes the ring as having an edge. I think the numeral is 30. I might state that you can always refer back to the specification to find the meaning of any part. The specification says:

> "As clearly shown this rim member 29 extends inwardly as at 30 beyond the rim 16 and thus overhangs the outer marginal portion of the sediment trap."

It comes to a point 30 and then slants back in toward the wall 16.

251 Q. Now, still referring to the tub construction, on the inside of the tub there is an inwardly rounded baffle 45, which has some holes in it, which is for holding clothes down, but it does not interfere with the movement of the water outwardly during the extraction portion of the cycle, as I will state later on.

Then also inside of the tub, of course, is the agitator D, which has a central standard portion that reaches up over the spindle 19; and that standard comes down and it is flared out at the bottom and terminates at an edge 27, having a diameter such that it overlies the ring 29, and hence also overlies the sediment trap.

Now, the term "sediment trap" is used in the specification, and in the drawings it is designated by the numeral 28 which appears in Figure 1.

Referring now to Figure 5 particularly, this is what is known as sectional view, and it would be the view of this device as though you cut it off horizontally at the level of the section line 15; but you will notice that that
252 section line dips down and goes under the edge 27 of the agitator; so that it shows what is under the agitator when viewed from the top, looking down.

Now, what is under there, of course, is the base 17, 18, that central casting, and which has in it the sediment trap 28; and by referring to Figure 5 you will notice that the sediment trap has a wall which is really the inside wall of the rim 16, and that wall has the numeral 28a in Figure 5. This wall is not circular but increases in diameter from a minimum diameter, when observed adjacent to the numeral 28a in that area, to an increasing diameter at the outlets 31.

Now, the outlets 31—the patent says that you can have one or more of these, and two are shown in all of the figures. The outlets, first of all, are at a portion of the wall 28a which is farther away from the axis of rotation than other parts of the wall; and at such outlet 31 there is made a connection to a pipe, which, as shown in Figure 1, curves upwardly and outwardly and then runs up along the outside of the tub assembly, and is fastened up at the top. This pipe has a discharge opening designated 33.

253 You will notice that there is a shaft 22. I think he calls it a shaft. There is a shaft 22 which goes through what evidently is a ball bearing in the standard 11, and above the ball bearing is a flange through which

the capscrews 20 reach down to the base member and hold it onto it. So that, when the shaft 22 turns, the whole base will turn, and hence the tub will be turned around rapidly, or as rapidly as the shaft 22 turns.

To the inside of that shaft 22 there is another shaft 24, which is independently rotated, and is connected to the agitator D, and that is the one that works the agitator, oscillates it back and forth.

The water level in the tub is determined actually by the height of the outlet opening 33, because if water is placed in the tub it will fill the tub and will rise in both of the tubes 32 until finally it will run out at 33.

The working range of most washing is not stated specifically in the specification, but I presume would be in the range of the baffle, depending on the amount of clothes.

254 The specification also describes what happens when the machine is operated in the washing of the clothes, and also during the extraction of the water from the washed clothes. What happens is that, assuming that the clothes are dirty and have some amount of grit in them, they are put in the tub and the necessary amount of water put in, and the machine is started; and the agitator D goes back and forth in an oscillatory motion and in so doing loosens the grit and the dirt, which then falling loose from the clothes, and being heavier than the water, will go down through the dished bottom, follow down the slant of the dished bottom, always proceeding downward and hence toward the center until it gets under that rim 27 of the agitator, and it continues on then down over the ring 29, and falls over the edge 30, and then down into the annular trap at 28.

The motion of the liquid in the trap—of course, it is

also filled with water—is not as great as it would be above the edge 27, because above that edge there are the vanes 25 which swish the clothes back and forth for washing; so when gravel gets down into the trap 28, it stays
255 there fairly well.

Of course, there is always a lot of dirt that is dissolved in the water, at least suspended in the water, and this is particularly true where a detergent is added, so that some of the dirt is carried in suspension, and then there is always some amount of dirt that is linty or loose and tends to float.

The specification states that when the extraction begins, the tub C is rotated; and when this occurs, the rotation will tend first to—well, cause the water to leave the tub by two paths. One of the paths of the motion of the water is shown by the dotted arrows in the upper part of Figure 1. You will notice that there are a series of arrows that are going along in an upward and outward direction from the center of the tub, through the holes in the baffle and out through discharge openings 36.

The other flow of the liquid from the tub takes place out through the tub 32. The reason for this is that as the tub is rotated, the liquid which is in each of the tubes 32, or one of the tubes if it is used, will be thrown cen-
256 trifugally outward, and this produces a force which makes the liquid level rise in the tube 32 until it overflows the edge 33, depending upon the speed a considerable force, a considerable pumping action, will be caused in that way.

Hence, there is a twofold flow from the tub, part of the water going out in the direction of the dotted arrows, and part of it going out from the trap 28, and the latter flow is sufficiently strong so that also carries out heavy sedimentary material within the trap.

Now, such a flow will continue, the two flows will continue, until the water level in the tub—well, until air reaches the point of the rim 27 and air begins to get under the agitator D, and also until really the level gets down to the edge 30 on the ring. At that time the residue of the water in the trap will be thrown on out, and afterwards there is no more water can come in there, and the residue of the water in the clothes will be thrown centrifugally outward against the wall of the tub, and since the tub is tapered upwardly the flow will be through the clothing then and finally out through the openings 36.

257 Q. Will you now explain the structure as disclosed in the Roth patent?

A. I am now referring to the Roth patent No. 2,633,727, and will explain it. The drawings of this patent are considerably simplified, because the specification states that it is a machine of the type specified in the Castner original patent, which is, of course, the same as in the reissue patent.

I should say, first, that there is a tub generally designated A, which has a top portion 10, which is of a larger diameter at the top than it is at the bottom, the walls decreasing in diameter as you go to lower levels, and then go around the curved or dished portion, and finally at point 11, the wall drops abruptly down and then runs horizontally in. That can be seen from the portion that is sectioned at the lower right-hand part of Figure 1.

A fastening of that upper portion of the tub is then made to a base plate which is mounted on a rotatable spindle 16.

Inside there is an agitator B which is mounted on and operated by the shaft 17.

258 The downwardly sloping wall 19 is called an in-

wardly turned flange, which produces a recess in the base of the tub, the recess bearing the numeral 18; and there is a sediment trap, annular sediment trap, that runs around the base of the tub and in it there is a pocket 22. It is called an outlet or a pocket 22, which hangs down a little bit farther. The pocket can be seen in both of the figures. From the pocket there extends a tube 24, which is called a discharge tube.

Now, by looking at both of the figures, Figure 1 and Figure 2, first in Figure 2, you will notice that the tube 23 appears to extend directly outwardly, and then it curves up along the tub in a direction that is opposite to the direction of rotation, the direction of rotation is shown by the arrow in Figure 2. Now, I said it appears in Figure 2 to extend directly outwardly; but if you will look at Figure 1, you will see that it also curves up during that portion. So, this tube goes outwardly and upwardly and then spirally up alongside the tub in a direction opposite to the direction of rotation.

259 The washing action is the same. The grit or gravel goes down at the bottom of the tub where it reaches quiet water under the skirt of the agitator. The skirt of the agitator is numeral 13 in Figure 1 and extends out slightly beyond the recess 18, that is to say, slightly beyond the inwardly turned flange 19.

So the gravel and sand and anything else that is hard and heavy that is shaken loose during the washing operation comes down the dished bottom and goes into the annular recess at 18; then, of course, the tub is all full of water, and the tube 24 is full of water, and there comes a time when the agitator stops, and the tub begins to spin.

Now, the tub as it is spun around and gradually increases in rate of rotation—it does not abruptly come up to

a high speed; it has a period of acceleration; it is gradually increasing its rotation or velocity for perhaps some seconds or maybe half a minute or so.

Now, the idea of the Roth patent was to utilize the spiral rearwardly turned direction of the tube 24 to produce a greater rate of discharge than could be obtained
260 merely bringing the discharge tube straight up alongside of the tub.

Now, there are two effects which take place here. In the Castner type device the tube simply—that would be either of the Castner patents—the tube simply comes up along the outside of the tub and the discharge of the liquid that is inside of the tube is merely by the centrifugal action. You can figure that this way; there will be an increment of water, you might call it a slug of water, for example, an inch long, that is in the tube at the point where it goes through the rim 16; and at any speed of rotation there is a certain centrifugal force on that increment of water, and it tends therefore to be thrown out; and as it is thrown out, it goes up the tube, and, of course produces a suction behind it and pulls the water in behind it, and will keep on doing that as long as there is any water to be taken out.

Now, the Roth patent that same thing happens, but in addition there is another force which is due to the acceleration and the rotational speed.

261 Remembering that there is water in the tube 24 to the level of the water in the tub; then as the tub begins to turn, first it begins to turn slowly and then it continues to increase and go around faster and faster.

Now, this is the same as driving—the slug of water wants to stand still and the tube pulls ahead, and since the water wants to stand still it simply goes up the hill, and there will be a force produced as long as the tub continues to be

spun at an increasing rate of rotation; in other words, as long as it is accelerated, there will be that additional force.

So, in the Roth patent there are two forces here: One is the centrifugal and the other is the force due to the inertia of the liquid in the tube and the increase of velocity and the effect upon it.

Q. Now, Mr. Dugger, before I have you apply the claims of the various patents in suit that we rely upon, I would like to have you describe the various Beam and defendant's structures. For that purpose you will probably want to use the exhibits that have previously been
262 offered in evidence. I will let you proceed in any way you can find most expeditious.

A. I will first refer to Plaintiff's Exhibit 1 and Plaintiff's Exhibit 3, which are entitled—I think they have been previously designated as—I beg your pardon. I will first refer to Plaintiff's Exhibit 1.

Mr. Carlsen: The witness is going to use the original exhibits. Possibly you would like another set to follow him.

The Court: Do I have them here?

Mr. Carlsen: No, he is using the original ones offered in evidence, because he may want to write on them. It is a little easier that way. This is my set of copies.

The Witness: I chose the wrong ones first. I wanted 12 and 13. That is the Beam first and second designs. Does your Honor have those?

The Court: Yes, 12 and 13.

By the Witness:

A. 12 and 13. And if I may, I would like also to
263 refer to the actual physical exhibits. It helps a little bit. We will take Exhibit 12. Exhibit 12 is very much like the Castner patent in suit. I think I can say that it is the same in all respects except the top, the top con-

struction of the tub member. It has the casting at the bottom, which in this Exhibit 14 is a unitary casting. That is one piece here. And you can see how the sheet metal upper portion of the tub comes down to a decreasing diameter to the lower level that is dished in, and then drops down so as to make room for this rim, which in the patent is the rim of 16; and there is a gasket underneath and over the flange of the upper sheet metal portion of the tub, and the screws go through it.

Looking at the base member itself, you will notice the diameter of this inner wall of this trap increases toward the point at which the discharge is connected. It increases in each direction, the discharge point having a larger diameter than some other portion of the wall. The midpoint of the minimum diameter of the wall would be at 90 degrees to the axis of the two discharges.

264 The agitator when it is in operation comes down and sets on a level so that there is a little space beneath its lower edge or rim of the skirt; and the skirt has a diameter such that it reaches out almost to the full diameter of the rim 16 in the patent, and hence covers the annular groove in which the sediment is collected.

The top of the tub in the patent does not have a balancing ring on it or, at least, a heavy ring. As I understand this matter of balance, if you put some clothes in here and they don't happen to distribute evenly when the tub begins to spin, well, then, the weight of the clothes is disproportionately large with respect to the weight of the tub itself and will make it shake; but if the tub is heavier, then the weight of the clothes is a small percentage of the weight, and hence does not shake so much. So that, apparently, does not have any bearing here, but it does form the top of the tub, and it is shaped so as to be a baffle, and it is

set up so this part fits a discharge the same as opening 6. It does not have a separate interior baffle there. And this tub also, in the patent there are shown some flutes on the outside of the sheet metal portion of the tub, and
265 the discharge of the water is straight out under the balancing ring. That description refers to Exhibit 14 and to the picture Exhibit 12, the Beam first design.

The Beam second design more closely resembles the Roth patent, which is the patent in issue. I am referring to Plaintiff's Exhibit 17 and to the picture which is Plaintiff's Exhibit 13.

Now, the Roth patent has a balancing ring on the top, which is much like the Beam first design balancing ring, but here the balancing ring is made up of segments that are fastened by capscrews that go through the side walls, and then the balancing rings are made so as to be spaced out from the inner surface a little bit, and there is a series of holes around there through which the water discharges.

But looking at the bottom of the tub, you will note there that the sheet metal comes down, drops down, and it is similar to the shape of the sheet metal portion in the Beam first design, held down by some screws which go into the base casting. There is a little rubber gasket which
266 overhangs the base, overhangs the sediment trap in the base.

And then looking at the bottom of the tub, you can see how the base casting has a downward boss which is hollow. You can feel it from the inside here, a little hole, or downward sump, and then on the outside is fastened the discharge tube which curves up along the side of the tube and discharges in a nearly horizontal direction. That slope, incidentally, of the discharge tube is the same direction as the slope shown in the Roth patent.

Now I will refer to the accused structures, first to Exhibit 1 and Exhibit 3, which go together and show this first accused device.

Now, for purposes of reference, I would like to use reference characters, and with the Court's permission I will put a few characters on Exhibit 1, which makes the reading more precise.

Mr. Carlsen: Is that agreeable?

Mr. Ooms: That is agreeable to me, your Honor.

The Court: All right.

By the Witness:

A. (continuing) I have already done that on my
267 personal copy, so I will go by it, and we will save changing them later on if I make a mistake.

I am now removing the agitator, which is the plastic agitator, from Exhibit 18-A, just for a little bit.

Now, in the accused device there is a base casting having a general designation 20. In general designation I put an arrow on the end of the leader so it makes it distinguishable from other numerals which refer to simply parts of the same thing.

That base casting here has a sort of a central dome, which I will call 21. It comes up and in the center of it is a spindle which reaches up, and, of course, would have to be above the water level of the washing in the tub. The top of it is not shown in Plaintiff's Exhibit 1, but is easily observed in Plaintiff's Exhibit 18. That base casting 20 has a horizontal flange portion which is provided with a group of bosses that I will give the numeral 22, use the numeral 22 on them; and each of them has a hole in it which is tapped to receive a capscrew for holding the sheet metal portion of the tub, which is the portion generally
268 designated 10. This sheet metal portion of the tub

has a maximum diameter at the top, and at the top there is an outward flange. In beneath the flange is a balancing ring 40, and above that flange there is another sheet metal member which has a sort of a pie crust edge so that parts of it are elevated above the flange and parts below, leaving some space that I will designate 44. It is through these spaces that the liquid within the tub flows out when the tub goes around during the extraction. This top sheet metal portion is necked in at 41 and terminates in a rolled over edge at 43. The sheet metal portion 10 of the tub is curved in at 12. That is right down where I have my finger now. And then runs substantially horizontally through the portion 13, and rises a little bit at 14, and then runs in again horizontally at 15.

Now, the part 15, which is really a termiating flange, sticking in, has a diameter so that it overlies the top of the bosses 22; and this portion 15 has holes in it at appropriate intervals so that it can be fastened down by a plural-
269 ity of capscrews, and in that way the two parts are held together.

Now, I will call attention to the act that there is a space on the inside of this flange—I will stick this piece of paper down in that space there—that is over the edge of the flange, and under it—that is the flange 15 between the bosses 22, and that permits the liquid in the tub to go out that way, to feed this trap below, which I will describe in a few minutes.

Also the horizontal part 13 has in it a plurality of holes which overlie the groove in the base.

Now, referring to the base, there is a sediment trap which is outside of the diameter of these bosses. It drops down and runs horizontally, and then comes up as a vertical wall. On top of that vertical wall is a rubber gasket, so

that when the tub 10 is pulled down by the capscrews, the sheet metal tub portion 10 will squeeze down on the top of the gasket and make a water seal.

Now, the tub in a whole is composed of the base 20 and the portion 10, which are fastened together by the capscrews and is sealed at this rubber gasket.

270 Now, by looking at this physical Exhibit 18, and also by looking at Exhibit 3, I want to call attention to the sediment trap, and, incidentally, I will refer back to Exhibit 1 and for convenience of reference we will put on a numeral 25 as designating the sediment trap wherever it appears.

The sediment trap, referring particularly to the Exhibit 3 is circular but eccentric. It has a minimum width opposite the outlet. You cannot see the outlet in the physical exhibit unless you turn the thing upside down.

Now, here is the outlet to which the outlet tube is attached. Now, I am going to put a numeral on that tube. We will call it 50. And it is attached at an outlet which I will designate 28. And the portion of the trap which is right next to the outlet I will call 25-A, because that is a part of 25, the trap 25.

Now, the trap is widest at that part 25-A, and it gradually decreases in width in each direction from the trap until it is narrowest at the part I call 25-B, which is diametrically opposite.

271 And also the trap, right at the outlet 25-A, drops down a little bit, I suppose to make room to fasten the tube to it down there. It takes a little place to put on the flange which holds the tube, the flange being held by a couple of screws. That makes the tube covering.

Now, I would like to explain a little bit more about the —well, before I get into that, I will show you where the agitator sets. The agitator, which is Exhibit 18-A, I will

generally designate as 30, Plaintiff's Exhibit 1, and it has an edge 31, which has a diameter such that you can just barely see the edges of the holes 27. I don't believe I used that designation before. The holes in the sheet metal member. member 10, there are some holes right over the trap. I will give that a numeral 27, so that we can talk about them.

When the agitator is put on it, it very nearly covers them. They just seem to peep out the barest little bit, perhaps it just does cover them.

Now, when the washing takes place this agitator goes back and forth here, as I am doing now, and the
272 liquid shakes the gravel and the grit and the sand loose from the clothes, and it falls down, of course; and it hits this inward curve of this dished bottom and slides on into the more or less horizontal portion 13 of the tub; and, of course, the water goes back and forth, and the gravel and grit drop down into the trapped part, which is 25, that is, the trap in the tub; and when it gets down through those holes, of course, the water is relatively quiet, and the gravel is not going to come back up again. So the gravel just tends to move right on down in the dish, and it swishes back and forth and finds its way through those holes. The holes actually act as a sort of a screen over the trap.

Now, when the washing is completed, the tub starts to turn, of course, and the extracting cycle, and what happens there is that there is water in that trap 25—the trap is 25—and, of course, there is also water in this tube 50; and if you can consider now that the water is in that lower curved part of the tube the centrifugal force will throw the water out. And also the tube doesn't rise quite straight up for it slants a little bit, because the tub also gets a little
273 bit larger; and this powerful centrifugal force, which is like gravity, because it always goes outward from

the center, and it is just the same as water running downhill, because the water comes out here and wants to run downhill, which is farther out on the radius, and finally it gets to the top and out it goes.

Now, for all the water that goes out, there also has to be some more water pulled in at the bottom along with the water in the tub, and that water will proceed into the trap through all the holes 27, and it will also go down through the little spaces between these bosses, and then all around here; so that leaves quite an area; and in Exhibit 1 there is an arrow showing that flow, and I put a numeral 24 on that arrow to show that flow. And the flow down through the holes itself, I will put a numeral on that. I think I am safe in using the numeral 29. That goes down through the little holes 27.

So, during this rotation, during the extraction, the water in the trap is thrown out and it is replaced; as long as there is water down there it will be replaced by more water
274 flowing down across the edge between the bosses 22, also through the holes 27 and into the trap; and, of course, it is at a very high velocity during that portion of the extraction, and it carries with it the sand and grit.

Meanwhile, there is another effect taking place, because this tub starts out probably two-thirds full of water, or however full the housewife might put it; and the first rotation here tends, of course, to put the water out. It is like taking a pail of water and turning it around in your hand; if you can rotate it a little bit, the water tends to pull toward the wall. It rises, and when it rises far enough it starts spilling out over the edge through these openings which I have numbered 44, all around this space, right out of there.

Now, those two discharges after a while are going to take out enough water so that in the center around the agitator

where there is no water any more, the air will be down to the edge 31 of the agitator, and pretty soon the water is thrown out of the trap, and from then on the water that is left in the clothing simply moves through the
275 clothing itself against the wall 10, and since it increases its diameter in an upward direction, the water rises and goes out through the holes 44, and you let it run as long as you want to or as long as practical, and then the clothes are damp dried.

Now, the second accused device is the same in many respects, and so I will call attention to what are now the differences.

The tub on the second accused device—I am referring now to Exhibit 19—looks pretty much the same. It has a base casting corresponding to the casting generally designated 20 in Exhibit 1; and it has a sheet metal portion corresponding to the portion 10. So I will put those numerals on Plaintiff's Exhibit 2.

Now, the picture Exhibit 2 shows a balancing ring, but Exhibit 19 does not; so I assume that there may have been a little bit of variation there in what was made from time to time, or perhaps they have taken that off.

It has the same top collar; however, the base 20 is made a little bit different here. The fastening of the two
276 pieces 10 and 20 at the bosses 22 by means of screws, and the space under the edge, the flange 15, that is all the same.

However, they have changed the shape of this sediment trap in that it is now circular. You can see that very well by looking at the base of this. It is of uniform radial width all the way around here; and you can see that also from the plan view of the base, which is Plaintiff's Exhibit 4, where the sediment trap, which I am going to call, because it is

different than in Plaintiff's Exhibit 1, I will call it 25-K. I called the other one 25. That is of uniform width. However, it goes all the way around; it is concentric and circular in form and it forms the bottom part of the tub. Then at once place around in that sediment trap 25-K, it gets deeper at the outlet which I will call 25-L; and that outlet is shaped so that it goes from the level of the trap itself, and gradually slants down, and presents a face to which the tube is attached.

Now, the tube is attached in the same way now by a little clamping flange and two screws, and the tube has a portion which extends tangentially. This is the circle,
277 the sediment trap is a circle, and the tube has a run which is tangential to the circle until it gets out far enough so that it clears adjacent portion of the tub, and then it has a straight rise up the tub, and the direction of rotation here is in a direction that the tangential portion is the trailing direction.

Now, the operation—I use the words "this way around". It is not very descriptive when I read it into the record, so I am going to put a direction of rotation in Exhibits 2 and 4. I will put an arrow adjacent to Figure 1, and call it 60, and I will put a similar arrow on Exhibit 4 and will number that 60.

The result of that construction here is that there is this inertia effect and the centrifugal effect on the liquid in the tube as the rotation proceeds. First of all, this little increment of water or slug of water in this horizontal or tangential portion of the tube wants to stand still—one of Newton's laws, I believe—and the tub is accelerating; so naturally the water tends to stand still and the tub wants to go faster, so the water moves relatively in the tube.
278 At the same time this tangent is actually an increas-

ing diameter relative to the center, so there is a centrifugal effect on it. Then, of course, when the water gets up here, the centrifugal effect is also present, and the net effect of the two is that the water gets out of the discharge tube.

The agitator Exhibit 18-A appears to—you can't tell precisely on Exhibit 19, because there is no spindle on there for locating the agitator; but if I hold it as nearly as I can so that it is concentric with the sediment groove, it appears to fit over the holes 27 in the same way that it did in respect to the first accused device.

The Court: We will adjourn until ten o'clock tomorrow morning.

(Whereupon an adjournment was taken to 10:00 o'clock a.m. of the following day, April 25, 1956.)

* * * * *

280 Mr. Carlsen: Mr. Hubbard is here this morning in response to Mr. Ooms' subpoena. Possibly he would like to examine him before we go ahead with our witness.

Mr. Ooms: I think it might be a courtesy to the witness, if agreeable to your Honor. We are only going to ask him about what features were on the various Hotpoint machines that Mr. Castner testified about. Is it agreeable to you, Mr. Hubbard, with the material you have just shown me, to have the examination now?

Mr. Hubbard: I would appreciate that now.

Mr. Ooms: We can then let the witness go back to his work. He is called by the defendant.

The Court: Out of turn.

Mr. Ooms: Yes.

281 ANDREW G. HUBBARD, called as a witness on the part of the defendant, being first duly sworn, testified as follows:

The Court: What is your name?
The Witness: Andrew G. Hubbard.
The Court: Where do you live?
The Witness: Naperville, Illinois.
The Court: What do you do?
The Witness: I am patent counsel for the Hotpoint Company Division of the General Electric Company.

Direct Examination by Mr. Ooms.

Q. Mr. Hubbard, in the course of this trial the license agreement between Hotpoint and Solar Corporation, now succeeded by Gamble-Skogmo, has been introduced in evidence here, together with a tabulation of the royalty payments by Hotpoint, Inc. What we are interested in learning from you, sir, is what features of the three that have been talked about by the witness were incorporated throughout the years in the different machines of the Hotpoint Company upon which royalties were paid under your
282 license agreement. Do you think you can give us that information?

A. Yes, I think I can, sir. They have varied from time to time as different models used one or another of the features.

Q. We have identified three features here as the sediment trap with a discharge tube, the snubber arrangement for vibration damper, and a so-called fluid drive between the motor and the spin shaft of the machine for softening the drive during the spinning cycle. Are you familiar with those three features?

A. I am, sir.

Q. And you recognize those as three which were licensed to you under the license that I have described?

A. Yes. As to the sediment ejection tube, there are two patents. One patent issued recently to Roth, the number of which I am not familiar with, we do not use.

The Court: I did not understand the last part of that sentence.

By the Witness:

A. There are two sediment ejection tube patents.
283 One is by a patentee by the name of Roth. We do not use the construction in that patent. We do use the construction in the reissue patent, the Castner reissue patent.

Q. Do you use the sediment trap construction on all of the Hotpoint automatic washing machines that are built by your company?

A. Our present production?

Q. Yes.

A. We do not, sir.

Q. When you say you use the Castner type of discharge tube and distinguish it from the Roth type, what difference do you make between the two?

A. Well, the type of discharge tube which we use extends radially outwardly from the bottom of the tub and then climbs the tub axially. As I understand in Roth's patent the tube is inclined rearwardly the direction of the rotation of the tub.

Q. Now, Mr. Hubbard, with the data you have procured, can you enumerate for us throughout the several years that your company has had this license from Solar the different machines you made by style number and which of the three features that we have identified
284 here as the sediment trap, the fluid drive, and the

snubber or damper, you had on those respective machines. Can you give us that tabulation?

A. Yes. I have with me here a tabulation which I obtained after discussing the matter with our engineering section, and referring to certain parts lists and service manuals which I have in my possession.

Q. Excuse me. One more question. Throughout the term of this license and the payment of royalties, did you have anything to do with the performance of your company under the license in so far as determining the features upon which royalties were payable and what would be paid?

A. It is one of my responsibilities to inform our statistical department as to what machines come under the royalty-paying provisions of the license agreement.

Q. And you have done that throughout the years since you have been with the company?

A. Yes, I have. In 1949 we manufactured two models, 10LC2 and 20LC2. Each of those models had all three of the features—Sediment ejection, snubbers and fluid drive.

285 In 1950 we had Model 10LC3 also with the three features.

In 1950 we had Model 20LC2 with the three features.

In 1951 and 1952 we had the 20LC3. This model did not use the sediment ejection tube. It did use the dampener or snubbing equipment and the fluid coupling.

Q. May I stop you there one moment, Mr. Hubbard? Up to the model you last identified, you had used three features and in the model you last identified you used two?

A. That is right, sir.

Q. And how did dropping the sediment trap—did that affect your royalty liabilities on the machine?

A. It did not.

Q. Will you proceed?

A. In 1953 we manufactured the 10LH1, containing all three of the features.

We manufactured also the 10LH2, which had only the snubbers and the fluid coupling.

In 1954 we manufactured the 20LH1, having the three features.

286 We manufactured the 10LK1, having the three features.

We manufactured the 20LH2, having only the damper and the fluid coupling.

In 1955 we manufactured our 5LH7, which contained only the fluid coupling.

We manufactured also the 10LH7 on which none of the three features was used.

Q. In the year 1955 you mention that you had one model on which you incorporated the fluid drive. When you used that feature alone as you used it in that 1955 production, did that give you a lower royalty rate than if you had used all three of the features or an additional feature besides the fluid drive as you used it?

A. It did not.

Q. Will you proceed?

A. In 1955 we manufactured the 10LJ2, having only the fluid drive.

We manufactured the 10LJ3, having only the fluid drive, and the 10LK2 having only the fluid drive.

We manufactured 10LH8 in 1955, with none of the three features; and the 20LH8, with none of the three features.

287 Our current 1956 production includes the 10LH11, with none of the three features; the 10LJ11, with the sediment ejection tube only; and the 10LK11, with the sediment ejection tubes only.

Q. Are you able to tell us, Mr. Hubbard, whether in any of these machines in which you did not incorporate the sediment ejection feature you actually used the same base casting with the trap in it as you used when you did have a discharge tube mounted thereon?

A. I am not able to tell you, sir.

Q. You brought with you this morning a Hotpoint service manual which has pictures and figures of these various models. Is that a copy in general distribution that we could have here? I think we might find it useful if counsel and I had any differences about further details.

A. I see no reason why you should not have it. It is in general circulation among servicing organizations to enable them to order parts and so on for our washing machines.

Mr. Ooms: I have no intention of offering it in evidence at this time, your Honor, but in case it should prove
288 during the course of the trial useful, I think counsel and I could agree on what may go in, rather than examining the witness about it at large. If the witness is agreeable to leaving it here, I shall appreciate that.

The Court: All right.

The Witness: Yes, it is, sir.

Mr. Ooms: That concludes the direct examination of Mr. Hubbard.

Cross Examination by Mr. Carlsen.

Q. Mr. Hubbard, you referred to what I believe you called the Model LK11. I will ask you if that is the machine which has been shown in the circular which has been identified as Plaintiff's Exhibit 38.

A. Yes, I should say that it is, sir.

Q. That circular bears the publication date of 10-55, which would indicate that it was printed in October of last year; is that correct?

A. I believe that is right.

Q. So that that would be a machine for the 1956 production and distribution?

289 A. Yes.

Q. Is that also the machine that is publicized on page 90 of the current Life Magazine for April 23, 1956, of which I show you a copy?

A. Well, this advertisement does not specifically refer to a model number.

Q. May I call your attention to some of the descriptive matter there included in the second column—

"Deep flow rinses, the efficient sediment swirlout removes suds, soil, lint, even sand."

Would that help to identify the machine that is illustrated?

A. No, it would not, Mr. Carlsen.

Q. Does that descriptive matter indicate that that particular machine has the sediment tube?

A. No, I think it does not.

Q. But it is the machine that is currently being sold as your super deluxe Hotpoint push botton automatic washer, as illustrated in this Plaintiff's Exhibit 38?

A. Is that the 10LK11?

Q. Yes.

A. Yes.

290 Q. Now, that machine has the sediment trap and tube features?

A. It does.

Q. And you are paying royalties currently on that?

A. We are.

Q. Is there any other feature of that machine that is covered by any of the patents in the Solar agreement?

A. We consider that there are no other patents covered by the agreement in that machine.

Q. In other words, as far as this super deluxe machine is concerned, you have completely eliminated the snubbing feature and the fluid drive in so far as the Solar agreement patents are concerned?

A. We believe we have.

Q. Now, I call your attention to the copy of a letter that bears your signature, written to Mr. Castner on November 12, 1954. While I will not read the whole letter, I will read this statement:

"However, it is by this time no secret that we are trying to design out of your patents and thus reduce or eliminate the royalty payments."

291 Do you remember making that statement to Mr. Castner?

A. Yes. That appears to be a copy of a letter which I wrote.

Q. And that is perfectly a legitimate position for your company to take, is it not?

A. I think it is.

Q. Now, in the statistics and in the book you have kindly offered to leave with us, will it be possible for us to determine percentagewise the number of machines that you have sold which embody the sediment trap and the ejector tube features?

A. It will not.

Q. In other words, the only facts we can get from this particular book and publication and your statistical sheet there is model numbers?

A. That is correct. And mechanical features, I should say.

Mr. Carlsen: No further examination.

Mr. Ooms: No further examination. Thank you, Mr. Hubbard.

(Witness excused.)

292 RALPH L. DUGGER, a witness on the part of the plaintiff, having been heretofore duly sworn herein, resumed the stand and testified further as follows:

Direct Examination by Mr. Carlsen (ctd.).

Q. You are the same Ralph Dugger that was on the stand yesterday afternoon?

A. Yes, sir.

Q. Have you prepared, or have you assisted in the preparation of any charts for the purpose of comparing the claims in suit here with the various structures involved?

A. I have.

Q. What is the source of the material for these charts?

A. In preparing such charts I referred to the patents, copies of the patents in suit, and to the drawings which you told me were stipulated drawings of the accused structures, and of the Beam design.

Q. And you have included other drawings of your own or information other than what is already in evidence here?

A. I beg your pardon?

293 Q. Do you have included any other material except what is in evidence up to this point?

A. That is correct.

Q. I will now hand you Chart A, which also has been identified as Plaintiff's Exhibit 20, and ask you if that is one of the charts.

A. It is.

Q. Do you have a copy of that chart for your own working purposes, Mr. Dugger?

A. I have.

Mr. Carlsen: Possibly we could let the Court have the original then to follow as you are explaining it.

(Handing chart to the Court.)

By Mr. Carlsen:

Q. Will you proceed, Mr. Dugger?

A. In proceeding with this analysis I have first made several charts, of which this Chart A is one. I have first in this chart shown the manner in which claim 4, which is identical in both the Castner original patent and the reissue, applies to the structure shown in such patents; and for this purpose I have shown Figures 1 and 5 of such patents.

294 I will mention that in the succeeding charts I will show how the same claim applies to the Beam design the Beam first design, and to the Norge first and second designs.

Referring now to the chart Exhibit 20. At the right-hand side there are Figures 1 and 5 of the patent to Castner. These figures are the same in both the original and reissue patents.

On the left-hand side the claim, which is claim 4, has been broken down into its component phrases for the purpose of analysis.

Beginning, the claim states:

"In a washing machine"—

which, of course, it is. The first phrase (a) in this analysis reads:

"a rotatable tub having"—

There is such a rotatable tub in the machine. Then the modifying phrase (b):

"an imperforate upwardly flared side wall"—

That phraseology is probably descriptive of the flare on the tub structure C of the Castner patent. Then the word continues with the phrase (bb)—operative, w[illegible] ro-

295 tated at high speed, to centrifugally disch[illegible] the

fluid content of the tub upwardly along said wall and thence outwardly over its upper edge. From this phrase which is shown in a box that has been colored lightly with blue pencil in this analysis chart Exhibit 20 I have in the picture shown this path of the movement of the water in the tub by the blue arrows. This movement is also shown by the small dotted arrows in the original patent; and it will, of course, be understood that as the water level increases in the tub and the speed increases more of it stands against the side wall and flows as shown in the blue arrows on up and out of the openings 36, which form the effective top of the tub, or the effective upper edge.

The claim then continues with the phrase (c):

"said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

The tub C has a bottom, the lowermost part of which is the base casting 17, 18; and it has a trap space 28 in it.

296 The wall of the tub curves downwardly at the portion 14, and the word "dished" is aptly descriptive of the shape below the section line 5-5.

The claim then continues with the phrase (d):

"and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom"—

This refers to one or both of the tubes 32 which are connected to the rim 16 (see Figure 5) which defines the periphery of the sediment trap 28. You will note this tube 32 does extend outwardly and upwardly, as can be seen from noting in Figure 5 how the tube extends radially outwardly, and from Figure 1 how it bends upwardly and continues along the side of the wall of the tub.

The claim then concludes with the phrase (dd):

"to discharge sedimentary material from the trap in-

dependently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall."

297 This flow or supplemental independent discharge is colored in red in the chart and in the drawings.

You will note that I have added a small red arrow showing how the flow will go under the rim of 27, of the agitator D, and thence into the trap, where the trap is shown tinted lightly in red, and the flow upwardly through the tube, upwardly and outwardly through the tube 32, is also shown in red, and rises and goes over as a spray at the upper end of the tube 33.

Now, I wish to explain that when the centrifugal extraction of the water from the whole tub commences, water is thrown out through the tube 32 and discharges at 33. At this time there is water in the tub sufficient to cover the agitator to a considerable depth, and all of the water that is thrown out through the tube 32 and is discharged at 33, is replaced by a downward flow which occurs under the rim 27 of the agitator, and this flow will continue until the total quantity of water in the tub has sufficiently diminished so that the rim 27 is uncovered and air stands at that point, and the flow even continues a little while longer until the trap is empty.

298 After that the residue of the moisture in the clothing, which is at that time thrown up against the wall of the tub, the residue flows through the clothing itself and against the tub wall, and since the tub is tapered to a larger diameter at higher elevation, the flow is upwardly against the wall, and the residual moisture goes out at 36.

Q. Will you now explain Chart B, which is also marked Plaintiff's Exhibit 21?

299 A. Chart B which is Exhibit 21 is a picture of the Beam first design and it has no reference charac-

ters on it, on the picture.

This picture is the stipulated drawing illustrating the conception of the Beam first design, and corresponds to the physical Exhibit 14.

A comparison—may I inquire of counsel the exhibit number of the stipulated drawing, please?

Mr. Carlsen: Plaintiff's Exhibit 12.

By the Witness:

A. (continuing) The chart, Exhibit 21, the drawing, corresponds to the picture of Beam's first design, which is Plaintiff's Exhibit 12.

Now, in this picture I have shown the course of discharge of the two flows from the tub.

This tub (indicating) like that in the patent, is tapered upwardly so that it has an increased diameter at its top and under the balancing ring, there are spaces through which the water of the main discharge may flow out.

At the bottom, the construction, except possibly for slight variations, is identical, it appears to be identical with that of the Castner patents.

300 There is a base casting to which the sheet metal body portion of the tub is attached. The bottom portion of the tub has a dish bottom part and it is clamped to the base casting which confines a sediment trap. It is clamped between two rubber gaskets to the clamping ring, which, in turn, is held down by some screws.

The base casting has a sediment trap in it and there are two—well, the sediment trap is slightly oval in shape and from the two points of the oval, which are along the maximum diameter, the largest axis and hence are at the farthest distance from the axis of rotation, there are connections made to the tubes which rise up outside of the tub.

The claim applies to this Beam of the first design in the

same way as it does to the patent in suit. It does have a washing machine. There is:

"* * * a rotatable tub having an imperforate upwardly flared side wall"

and that tub is

"* * * operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over
301 its upper edge,"

The upper edge of the tub I have used in this plate is the upper effective edge and that is where the water discharges out, as shown by the blue spray lines in the picture. It is also shown by the blue arrows showing generally that the water sinks towards the center of the tub during centrifuging and rises against the wall edge until it sprays out.

The claim further states:

"* * * said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap,"

and this wall of the tub does form a dish shape and it terminates at this sediment trap, which I have tinted in red, which is in the base casting.

And the claim then continues:

"* * * and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom."

This is the tube, as shown in the picture, connected across the major axis of the sediment trap and then
302 outwardly and upwardly and this tube does have the effect of:

"* * * to discharge sedimentary material from the trap independently of the upward and outward centrifugal

discharge of the main body of fluid along and over the tub wall."

That discharge is shown tinted in red. The trap I have shown as being filled with liquid and the tube, where it is broken away, colored, and the spray of the water which is discharged is shown in red at the upper end of the tube.

By Mr. Carlsen:

Q. Will you now explain Chart C, Plaintiff's Exhibit 22?

A. In Chart C, the drawings that were used were stipulated drawings. May I request, counsel, for the exhibit numbers of these drawings of the Norge first design? I think they were Exhibits 1 and 3, if I recall correctly.

Mr. Carlsen: 3—1 and 3.

By the Witness:

A. (continuing) There are two drawings here of stipulated Plaintiff's Exhibits 1 and 3 and the one that is shown in my chart corresponds to Plaintiff's Exhibit 1.

303 That is a perspective broken away view in Figure 1 and then there are some sections at Figures 2 and 3. In the chart I have only shown Figures 2 and 3. Exhibit 3 is the plan view of the bottom portion casting of the tube and it was useful in understanding the construction.

Now, to refer to this chart which is Plaintiff's Exhibit 22—and I see I haven't marked that exhibit number on my copy, so I will add it now—in this Norge first design there is a tub which is rotatable. First of all, it is a washing machine and there is a tub that is rotatable, thus satisfying the requirements of the phrase (a):

"* * * a rotatable tub having"

If we examine the tub, we find that the walls are imperforate. Otherwise, it wouldn't hold water. Therefore, it satisfies the phrase of the claim (b):

"* * * an imperforate upwardly flared side wall"

I didn't mention in my previous statement that in the Norge first design, the wall does increase in diam-
304 eter at higher elevations and accordingly, satisfies the word "flared"—"upwardly flared."

The claim then continues:

"* * * operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge,"

this being phrase (bb).

The rotation of the tub in the Norge first design and its shape are such that as the tub rotates, the fluid content within the tub will—the level of the fluid contents will decrease at the center and rise around the walls as the rotation of velocity increases, until the level has risen to the point at which it will flow over through the little openings around what I have previously described as a pie crust edge.

I will now step down and refer to the Norge first design and, to show where that flow goes out over the edge, I will insert a piece of paper like this (illustrating). The water flows out—I have now inserted a slip of paper through one of the openings of the pie crust edge and that is where water flows out as the tub goes around.

305 Now, continuing with the claim, it states that (c):

"* * * said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

This wall does curve in, thereby satisfying the wording "dished" and the wall is effective as a wall until it reaches the nearest portion of the opening—these little series of openings around the trap. From that point on, the wall merely serves as a fastening and as a screen. It reaches

across and is fastened by a series of cap screws that are threaded into bosses on the base casting but it will be readily observed that there is ample space for flow to occur between each of these bosses and for this purpose, I have torn some slips of paper and I have inserted them to show how that flow occurs and I will tell you why it is important.

From where the aperture begins in a direction radially towards the center of the tub, this wall is effective and it, therefore, terminates as a wall at that point of the aperture. The aperture is nothing more than a screen and forms an extension of the metal; sufficient to perform the
306 function of a fastening.

It would be perfectly mechanically feasible to have these screws on the outer side towards the curve and, for that reason only, necessary to thicken the rim of the sediment trap a little bit to run the screws into it.

Mr. Carlsen: May I interrupt just long enough to make it of record that the witness is speaking of Exhibit 18, physically?

By the Witness:

A. (continuing) I have taken the time to refer to the physical exhibit as well as Exhibit 22, which is the chart, to show my mode of thinking in respect to this claim language and particularly the phrase which reads:

> "* * * said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

I conclude that the wall terminates as a wall where the perforations begin and that is the sediment trap. Beyond that, at those little apertures, it serves as a screen and merely as a mechanical expedient, by means of which the wall portion of the tub is fastened to the base cast-
307 ing of the tub, both parts of the same unit.

The balance of the claim continues (d):

"* * * and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom"

which is the tube labeled "discharge tube" in Figure 1 of Exhibit 22 and the tube which I will refer to in the physical Exhibit 18, the one that is aluminum colored and fastened to the sediment trap.

You can feel it—well, you can't feel it in this exhibit, but we have had them where we have reached down and we have felt the tube does connect through the aperture to the sediment trap. The sediment trap is that portion of the base casting which is labeled "sediment trap" in Figure 1 of Exhibit 22 and I have shown it as tinted in red and there are also some little red arrows shown in Figures 1, 2 and 3 of this exhibit to illustrate the manner in which the flow does occur and this is pertinent to the last phrase in the claim reading (dd):

"* * * to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall."

This flow has been illustrated in the chart, Exhibit 22, by tinting slightly in red color the trap portion which is, of course, full of liquid when the flow occurs, until it is completed, and by showing the spray of red color in Figure 1 of Exhibit 22 that emanates from the upper end of the discharge tube.

The direction of this flow during the rotation—would you cancel that or just scratch it?

During the initiation of the discharge through centrifuging, the tube, of course, stands originally full of water. As the rotation begins, the centrifugal force in the outwardly

extending portion and in the taper—there is a slight taper and, therefore, it has an outward component on the rising portion of the tube. That makes the water go out that has already stood in the tube and then it has to be replaced by additional flow from the inside because you can't take the water out of the tube and pull it back. Actually, the physical effect is that the air pressure that is on all of us and on this tube, causes the water to be pushed down and as it is thrown out of the tube, the atmospheric air pres-
309 sure causes the water to be pushed in. This really acts like a pump. It throws the water out and more water flows in the bottom and it throws the water out and more water flows in again. The water that goes into it goes through the little holes which I have not given a number to, the holes, but they are the ones that lay over the sediment trap and, in effect, form a screen over it and also through the holes at the inner edge of the sheet metal portion of the tub where it is bolted or held down by cap screws on the bosses.

That is a very material thing in this construction because there must be water coming in to replace that which goes out and if that inward flow is pinched off, it won't flow so very good and it won't throw out the sand.

You need velocity to throw the sand and the grit out and it is achieved, although albeit in a somewhat obscure way, by making the fastening on spaced lugs. Of course, there is also flow through these little apertures which form the screen portion over the sediment trap.

By Mr. Carlson:

Q. Will you now apply the claim 4 to the Norge second design as shown in Chart D, Plaintiff's Exhibit
310 23?

A. What is the number?

The Court: 23.

The Witness: Thank you, your Honor.

By the Witness:

A. In Chart 23, the presentation is similar. The pictures are the same, or were taken from Plaintiff's Exhibit 2, which was the stipulated picture showing the Norge second design, and the construction is quite similar. The construction is quite similar insofar as the shape of the tub is concerned. It has the pie crust edge. It is flared upwardly. It has discharge openings along the pie crust edge. It does have the dished bottom. It extends across over the screening apertures and then to the fastening screws, which are landed on the bosses on the base casting.

This design differs from the first Norge design principally in that the sediment trap in the Norge first design was circular but eccentric. In this one the sediment trap is circular and concentric, of the same width all the way around. However, the sediment trap does have a well in it at one point which increases at one point in the trap in a
311 trailing direction with respect to the direction of rotation, and the tube that leaves that well in that sediment trap leads in a tangential direction, hence extending outwardly tangentially or rearwardly with respect to direction of rotation and then up.

Now, the operation is substantially the same and the mode of applying the claim, claim 4, to this Norge second design is likewise the same.

The claim, as shown in Chart 23—Exhibit 23, reads:

"In a washing machine,"

which of course this is, it does have:

"* * * a rotatable tub"

thus satisfying the phrase (a):

"* * * a rotatable tub having—"

The claim then continues with the phrase (b):

"* * * an imperforate upwardly flared side wall"

and that is true of this Norge second design. It does increase in diameter in the upward direction, thereby being flared and it is imperforate.

The claim then continues with the phrase (bb):

"* * * operative, when rotated at high speed, to
312 centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge."

This flow—this discharge or flow of the fluid content of the tub is illustrated by the arrows in blue on Figure 1 of Exhibit 23 and it is discharged upwardly and outwardly until it reaches the effective top of the tub and goes out through the little openings in the pie crust edge.

The claim then continues with phrase (c):

"* * * said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

I may have misread that.

The Court: Yes.

The Witness: It reads:

"* * * said wall having an inwardly dished bottom portion"

By the Witness:

A. (continuing) This wall is inwardly dished. It forms a dish shape at the bottom and it terminates just as explained with reference to the exhibit—what was the previous exhibit—just as explained with reference to
313 the previous exhibit, Exhibit 22, the Norge first design. The wall terminates effectively as a wall where the perforations begin and they form a screen.

The perforations to which I refer are the ring perfora-

tions immediately above the sediment trap in the base casting.

The claim then continues—well, I should say, first, that the base casting, of course, does have a depression forming a sediment trap and the wall does terminate right at that depression.

The next phrase of the claim (d):

> * * * and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom"

This is the tube labeled "discharge tube" in Figure 1 of Exhibit 23 (indicating), and it is the aluminum colored tube which extends from the wall in the sediment trap of the base casting and thence tangentially in a direction opposite to the direction of rotation and upwardly to the top of the tub side wall.

I say "opposite to the direction of rotation." You
314 can't tell from the exhibit alone, and in these remarks, I have been referring to Exhibits 19 and 23. However, it wouldn't work in any other way. I am sure that is the way it goes around and that is the way the machine did go around that I ran.

The claim then continues with the phrase (dd):

> "* * * to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall."

This phrase, which is boxed and shown slightly tinted in red, corresponds to the red markings in the comparative chart, Exhibit 23.

The flow is from the sediment trap, which is shown slightly tinted in the red, thence through the well in the sediment trap and outwardly and thence, from the discharge

tube as a spray. Of course, it is broken up in the spray because it is going around so fast.

The replacement flow which is from the top down into the discharge, into the sedimentary trap, is through the little apertures and also through these spaces between the bosses.

315 Incidentally, on this Exhibit 19, only half as many screws were used in attaching the tub. They used only every other boss on it for holding it down so there are spaces all along here (indicating) through which I have inserted paper and the flow passes through those spaces and downwardly through the openings to replace the water that is thrown out by the centrifugal action during the rotation of the tub, thrown out of the tube on the outside, and this replacement flow continues until the water is drawn down below the level of the rim on the agitator, which is Exhibit 18-A, and then gradually begins to take air and then it is over and the residue of the water goes out upwardly through the pie crust edge.

I am finished. I believe that completes it.

Mr. Carlsen: Your Honor, in view of defendant's admission of infringement as to claim 1 of Castner and claims 1 and 3 of the Roth patent it is going to be unnecessary for us to use a number of our charts that we had, but they were all pre-numbered before we came here so there

316 will be a little interruption in the sequence of numbering. In fact, we only have two charts left. I assume it would be agreeable to leave the numbers on them that we have on there?

The Court: It is all right.

Pardon me just one moment.

(Short recess taken.)

By Mr. Carlsen:

Q. Mr. Dugger, I will now ask you to apply claim 5 to

the first Norge design and to the disclosure in the Castner patent as shown on Plaintiff's Exhibit 25, Chart F.

A. This Chart F, which is in Plaintiff's Exhibit 25 is a little bit larger than the previous charts in that I have shown on the left the figures taken from the Castner patent and at the right, the pictures of the Norge first design.

In the middle is a breakdown of the claim, phrase by phrase.

Each of these phrases, except the introductory wording, have been given the letters "a" through "f". They are small letters in parentheses. It is "(a)" through "(f)".

317 I will just refer to it by the phrase letter. Now, this claim reads:

"In a washing machine—"

which, of course, this is true of the Norge first design and the Castner patent.

Phrase (a) reads:

"* * * a tub for containing liquid and material to be washed and mounted for spinning to discharge the liquid centrifugally."

This is true of both of these devices. The claim then continues with a definite phrase (b) reading:

"* * * said tub having upwardly flared side walls which will cause the centrifugal liquid to move upwardly therealong for discharge from the upper end of the tub."

Both of these devices have a tub in which the walls are flared upwardly and it is for the purpose of moving the main body of the liquid out of the tub by a centrifugal action and this flow of liquid from the tub, which is through the discharge apertures 36 in the Castner patents

318 and through the little apertures along the pie crust edge in the Norge first design—these flows are shown

by blue arrows and by the blue spray out of the discharge openings.

Claim 5 then continues with phrase (c) which reads:

"* * * said blue walls—"

I beg your pardon—

"* * * said side walls curving inwardly at their lower ends and terminating in an annular recess adapted to receive liquid and sedimentary material during the washing operation,"

The walls of the tub, as I previously explained, do curve inwar"y at the bottom which is below the section line of 5-5 in the Castner Figure 1 and below the corresponding level in the Norge first design. They curve inwardly and the wall terminates as a wall at the little apertures, the straining apertures or screenng apertures right above the sediment trap in the Norge first design, thereby meeting the requirements of this phrase.

The little apertures over the sediment trap are for the purpose of permitting sedimentary material such as
319 sand and gravel and grit to move down as the water is swished back and forth by the agitator. The heavy material which is loosened, falls, and it comes down in the curved side walls and is moved back and forth over the apertures which act just like a screen, just as though you were rubbing your hand over sand in a screen or riddle and this grit falls through into the sediment trap where, thereafter, it remains quiescent. That is during the washing operation.

The next phrase (d) reads:

"* * * a circular flange extending inwardly over the outer part of the recess to produce a horizontal separation of liquid during the spinning of the tub whereby the main body of liquid adjacent thereto will be de-

flected upwardly and whereby the liquid and sediment below the inner edge of the flange will be restricted to the space in the recess below the level of the flange."

Now, this phrase will require a little bit of explaining, the way I appreciate it reads on the Norge first design.

I will refer to physical Exhibit 18, and also particu-
320 larly to Figures 2 and 3 of the picture of the Norge first design that is at the right-hand part of Exhibit 25.

They would be the corresponding pictures in Plaintiff's Exhibit 2.

Now, I have said several times that this wall of the Norge design curves inwardly, it is like a dish, and it terminates as a wall where the apertures begin and that point where it terminates, overhangs the sedimentary trap.

Now, to show just what I mean, I will take Plaintiff's Exhibit 2 which is the Norge first design and put a vertical line there to show where the edge of the aperture is.

I am using a ball point pen so that it shows in blue. That is at Figure 2 of the Plaintiff's Exhibit 2; also in Figure 3. So, the wall coming down from the left, terminates where the aperture begins.

Now, this wall in the Castner patent and also in the Beam first design—you will notice that here the mechanics of the thing is different, that the wall goes down, the wall goes down and then it dips at an angle and then it goes horizontally again and that horizontal portion is
321 held between two rubber gaskets and then a clamping ring goes on there over it and the screws go through the ring and gaskets and this little flange (indicating) and into the wide rim on the outside of the sedimentary trap.

Now, the wall and the ring really act together. Here they are made in two parts. When I say "here", I mean in the Castner patent and in the Beam, Plaintiff's Exhibit 14, they are really in two parts and one part is—in this claim it is spoken of as being the wall and the other part as the flange.

Now, the flange is the part that overhangs. It is an overhanging part there (indicating). Now, you have the same thing, the same performance, the same mode of operation and the equivalent structure here (indicating) where you have the wall coming down. It curves in and then it runs across the rubber gasket and from there on, to where the wall terminates at the aperture, it acts like a flange, so the wall and the flange are all in the same piece.

Then, from the aperture on, it merely acts as a screen and fastening device, extending across.

322 In the Beam design of the Castner patent, the screws were placed on the outside. Since they use a different mode of fastening, they put gaskets above and below and the screws down through the rim.

So, to my way of thinking, in the accused device, in the Norge device, the wall and the flange are made the same. Hence, when you get to the phrase that I have quoted, that is, the phrase (d) where it says:

"* * * a circular flange extending inwardly over the outer part of the recess"

well, that is just the lower portion of the wall, the portion that does overhang.

And then, continuing with phrase (e) it reads:

"* * * means for preventing materials being washed from entering the recess with the sediment."

Now, in the Castner patent and in the Beam first design, that is accomplished by the rim of the agitator which

sufficiently overhangs the entrance into the recess so as to prevent clothes from going in there but it is not so tight down but that the water and gravel can go down.

323 Now, in the accused structure the same thing happens, since the edge of this rim on the agitator, which is Exhibit 18-A, overhangs the place where the grit and the gravel and the water enter the trap.

Now, in addition, I think the accused device does have a little extra something in that these apertures act as a screen and they will keep a button out or a safety pin out or something like that, whereas here (indicating), they might slide through, something that is fairly large might slide through, like a half dollar, but it wouldn't go out of the pipes.

The effect of the apertures is like a screen. Being over the trap, it would keep such large objects from entering the trap but it wouldn't prevent the sand and grit from getting in there, or the water from getting through.

Then, the phraseology continues. Phrase (f):

"* * * means for centrifugally discharging the contents of the recess independently of the main upward discharge of liquid from the tub."

324 That phrase has been colored lightly, tinted lightly in red and the portions of the apparatus where such centrifugal discharge takes place through the sedimentary trap and up through the tube both in the Castner patent and the Norge first design have been similarly colored and as I have previously explained with reference to some of the other claims.

Q. Will you show your remaining Chart G, Plaintiff's Exhibit 26, and explain what it shows?

A. In this chart also, which is Plaintiff's Exhibit 26, as shown in the Castner patent, at the left the pictures from the Castner patent, and the pictures of the Norge first

design at the right, I have the claim broken down in its phraseology in the center.

This is the claim of the reissue of the patent. Again I have the breakdown of the claim. It is similar to claim 4 in that you have phrases (a), (b), (bb), (c), (cc), (d) and (dd). Those are the breakdowns of the claim.

Now, reading the claim itself:

"In a washing machine,"

that is, of course, true; it does have

"* * * a rotatable tub having"

325 and such tub is

"* * * an imperforate upwardly flared side wall"

I have discussed that before, so I won't spend much time on it. It flares upwardly and it is imperforate in the Norge first design and in the Castner patent also.

Then the next phrase, which is (bb), and is the one shown in the box colored blue, it reads:

"* * * operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge,"

I have previously explained this. This is the flow that is represented by the blue arrows in both the Castner patent and also in the Norge first design. It is the flow that takes place through the aperture 36 in the Castner reissue patent and out through the apertures of the pie crust edge in the Norge first design. It is due to centrifugal action.

The claim then continues with phrase (c):

326 "* * * said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

I have explained that and the way I think this phrase reads properly on the Norge first design: the wall is dished,

it curves in at the bottom and it terminates in a depression. It terminates as a wall where the little apertures over the trap begin. Whether you call it a wall all the way or whether you call it a wall to the gasket, and then from there, out a flange with the apertures, that is where the water is supposed to go in. That is where it does go in. That is where the grit and gravel go in, and hence I think this phraseology does properly read on the Norge first design.

The claim then continues with the phrase (cc) and this one I have underlined, this phraseology which is in the box there, one of the boxes (indicating):

"* * * said depression extending annularly about the axis of the tub and being disposed within and below the dished bottom portion thereof whereby sediment may drain radially inwardly from all parts of the
327 bottom portion and into the sediment trap."

Now, if Mr. Douglas Carlsen will help me with this exhibit, again, which is Exhibit 18 and 18-A—

Now, the idea of having these walls curve down and in, is to assist the gravelly, gritty material to find its way to the place where you are going to catch it and so the walls do come down and in, and everything falling on them, tends to move towards the center and the oscillation of the agitator then works it around over the holes in the sheet metal which acts as a screen and it would fall through.

Now, the phrase says:

"* * * said depression extending annularly about the axis of the tub"

That is certainly what it does. It goes around the axis of the tub. That is the sedimentary receiving depression, the depression forming a sediment trap. It extends annularly about the axis of the tub and it is:

"* * * being disposed within and below the dished bottom portion"

and it is within, radially, and below in point of
328 elevation, the dished bottom portion.

"* * * whereby sediment may drain radially inwardly from all parts of the bottom portion and into the sediment trap,"

and that is exactly what it does.

And then, continuing, the next phrase reads (d):

"* * * and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom"

I have already spoken about that several times. It is that aluminum tube which is fastened to the trap.

The final phrase in the claim, which is the one that is tinted in red (dd):

"* * * to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall."

That discharge that occurs from the trap is illustrated
329 by the red tinting on Exhibit 26. The trap is in the Norge first design and also in Castner. It is illustrated in red tinting and the flow that takes place out of the discharge tube is also illustrated in red and I should add that such flow is independent of the previous flow mentioned, which is the blue flow.

Q. Mr. Dugger, there are two claims for which there were no charts prepared, I believe, namely, claims 6 and 7 of the reissue patent.

Would you briefly comment on them?

A. In my own personal copy of this reissue patent, I have marked, underscored in color the words of claims 6, 7 and 8, which the file history of the patent says—they were the words by which they compared from the claim 4 of the original patent.

Now, it might be best if we took the Court's copy and similarly underscored it because it saves hunting around. The file history is an exhibit here. It would be the file history of the reissue.

Q. Here is the copy that is in evidence.

Mr. Carlsen: Your Honor, would it be all right if I underscored those words corresponding?

330 The Court: It is all right.

The Witness: I will underscore them with a blue ink ball point pen.

In claim 6 of column 7, the words:

"* * * in a generally circular"

It begins in line 43 and then farther along in that line, and the next one, the words:

"* * * substantially annular."

Now, I think it was the oath in the file history you will find these differences. I took it right out of that.

And then, in claim 7, which begins in column 7 and continues in column 8, the words beginning in line 6:

"* * * in a substantially circular."

and then in the next line, which would be lines 8 and 9, the words:

"* * * concentrically within and below said dished bottom portion."

Now, while I am at it, I will just also mark the words that were added in claim 8, although I have already testified about that, but it will show the differences be-

331 tween the claims.

That begins in line 23, the words:

"* * * said depression extending"

and then it goes on down to the words:

"* * * sediment trap"

in line 28, so I will underscore those.

Now, referring to claim 6, the file history shows that that claim is identical in language with claim 4 of the original Castner patent and also claim 4 of the reissue. It wasn't changed, except for the addition of those words and, to save time, I will simply refer to my prior testimony by which I show why I think claim 4 reads on the accused device.

The Court: There is no need to repeat it.

The Witness: (continuing) There is no need to repeat that. Then, we simply focus attention on these underscored words.

Now, this modifying phraseology in 6 reads:

"* * * generally circular"

referring to—I have to read back in the claim:

332 "* * * terminating in a generally circular depression forming a substantially annular sediment trap."

So, referring now to the Norge devices, both of them, there is no question about it that they are generally circular.

In Exhibit 18 it is circular and it is slightly eccentric. What that means is that the trap is a little narrower at one side and a little wider over here if we had this off (indicating). It is a little wider where they have the discharge. So, they simply set the trap—the space is a little eccentric but it is still circular and it is entirely circular in the second design which is Exhibit 19. That is circular and concentric there (indicating).

So, both of the accused devices meet the requirement that the trap—that the depression is generally circular and substantially annular, as in claim 6, and the balance on this phraseology is met, as I have previously stated with reference to the analysis of claim 4.

333 Now, with respect to claim 7, the only difference is, again, the words:

"* * * substantially circular"

and that fits both of these accused devices and the words:

"* * * concentrically within and below said dished bottom."

So, the trap, when you speak about the bottom of the tub, dishes in and the trap is within the dished bottom portion and it is below from point of elevation.

So, both of the accused structures, Exhibits 18 and 19, meet that phraseology of claim 7 and the balance of the phraseology of claim 7 is like claim 4 and it meets that, as I have previously stated with reference to claim 4.

Mr. Carlsen: I now offer in evidence the charts which the witness has referred to and which have been marked as Plaintiff's Exhibits 20, 21, 22, 23, 25 and 26.

Mr. Ooms: I have no objection to them. Of course, it is understood that they are statements of counsel's opinion.

334 The Court: Yes. Very well. They may be received.

(Plaintiff's Exhibits 20, 21, 22, 23, 25 and 26 were received in evidence.)

Mr. Carlsen: That closes the direct examination of this witness.

The Court: Judge Igoe wishes to confer with me. We will recess until 2:00 o'clock.

(Whereupon a recess was taken to 2:00 o'clock p.m. of the same day, April 25, 1956.)

* * * * *

336 RALPH L. DUGGER, a witness on the part of the plaintiff, having been heretofore duly sworn herein, resumed the stand and testified further as follows:

Mr. Carlsen: I have one more question I would like to ask this witness before the cross examination.

Direct Examination by Mr. Carlsen (ctd.).

Q. Mr. Dugger, inasmuch as all the claims here relied upon have not been charted or applied to both of these defendant's accused structures, I will ask you by way of summary merely to identify the claims which you regard as readable on or applicable to the first and second Norge designs.

A. There are two Castner patents in suit, effective as I understand it over different time periods. The original Castner patent No. 2,470,104, claims 1, 4 and 5, in my judgment read properly upon the Norge first design.

In respect to the reissue Castner patent No. 23,626, claims 1, 4, 5, 6, 7 and 8 in my judgment are properly read upon both of the Norge designs, the first and second designs.

337 Mr. Carlsen: Inasmuch as it is agreed that the claims are infringed if valid, that concludes my direct examination.

Cross Examination by Mr. Ooms.

Q. Mr. Dugger, the claims 1, 4 and 5 in what you call the first Castner patent are identical with claims 1, 4 and 5 of the reissue patent, aren't they?

A. Yes; they are.

Q. And claims 6, 7 and 8 you pointed out this morning differed from claim 4 in the addition of a few limiting words which you underlined in the copy of the patent, I believe, of the Court.

A. I did.

Q. Now, where did you get that limiting language from the file wrapper of the Castner reissue patent?

A. I explained this morning that the particular words are cited in the file history of the reissue patent 23,626. That file history is an exhibit.

Q. I hand you Plaintiff's Exhibit No. 9 and call your attention to pages 17 and 18 of that document, and ask you if those are the passages to which you refer.

338 A. Well, it is page 18 that defines the passages.

Q. Well, it is part of a long passage that begins on page 17?

A. Yes, that is correct. It is part of the oath of George P. Castner; and the portion which is especially pertinent in defining the differences begins on page 18 of this Exhibit 9, beginning with the language:

"together with the new claims 6, 7 and 8, are believed to properly define the invention over such prior art. More specifically claim 4 should be construed, as now pointed out on page 7, to define a construction over such prior art. More specifically claim 4 should be construed, as now pointed out on page 7, to define a construction in which a dished bottom part 14 of the tub terminates"—

and then the language goes on some more. I will just put an ellipsis at that point. Then continuing:

"Concerning the new claims 6, 7 and 8, they are in no way broader than claim 4, but are identical

339 thereto except for limitations which have been added thereto, and are thus more limited in each instance. Thus claim 6 is identical"—

Then it goes on and lists the particulars in which identity is lacking. I worked from a similar abstract of the file history in making the markings on my personal copy of the reissue patent 23,626, and from it marked the Court's copy.

Q. You will agree with me, will you not, Mr. Dugger, that any structure that infringes either of the claims 6, 7 or 8 of the Castner patent reissue would also infringe claim 4 of that reissue?

A. Yes, I think that is true, claim 4 being the broader claim. If a structure conforms with a more limited definition, there is no instance in which a broader definition would not also be said to be readable upon the structure.

Q. If you can think of any situation which will qualify your answer later, you call it to my attention; but meanwhile we will proceed on the basis that anything that infringes either claim 6, 7 or 8 will infringe claim 4. That is correct, isn't it?

A. Yes, I think that is fair logic.

Q. And when the reissue was sought claim 4 of the original Castner patent was not changed with re-
340 spect to a single word, was it?

A. I believe that is correct.

Q. So that you will also agree with me, then, that any structure that infringes claim 6, 7 or 8 would infringe claim 4 of the original Castner patent?

A. Yes, that is correct.

Q. Now, you have read, and I think you anticipated somewhat when you were reading from page 18 of the oath of Mr. Castner in procuring this reissue, you read this passage from page 18:

> "More specifically claim 4 should be construed, as now pointed out on page 7, to define a construction in which a dished bottom part 14 of the tub terminates in a concentric or substantially annular recess or trap so that all areas of the dished tub bottom will drain freely and directly into the trap."

I read that correctly, do I not?

A. I believe so.

Q. And when Mr. Castner presented that under his oath to the Patent Office, he said from here on
341 that claim must have that interpretation, didn't he?

A. Well, that is what he said.

Q. He had previously said on page 17 of that oath that the patent was inoperative unless it was so read, didn't he?

A. I think the words will speak for themselves there, and I haven't read them.

Q. Well, you do recall, and I think you mentioned in your testimony yesterday, that when he reissued the patent he made no changes whatsoever in the drawings, but he did add a paragraph to the specification which is shown in italics on the Castner patent column 3, Castner reissue patent column 3.

A. Yes, sir.

Q. Now, that particular passage is substantially paraphrased in the passage I just read from his statement to the Patent Office as to how claim 4 should be construed, isn't it?

A. I am not sure I understand the question. I will ask the reporter to read it back.

(Question read by the reporter.)

Mr. Carlsen: May I ask if you are asking the witness
342 these questions as an expert on patent law? It seems to me, your Honor, it is going beyond the scope of proper cross examination. This record is one that will have to be interpreted on its face value for what it says and what it accomplishes in the Patent Office; and to ask this witness these questions which he has not even touched on in the direct examination, I think is improper and objectionable.

Mr. Ooms: Your Honor, he stated that in preparation for this testimony he studied these patents, he studied the file wrappers, he studied these drawings which he enumerated, and then he went on and in a series of charts gave your Honor his opinion as to how those claims should read, not only the drawing of the Castner patent but on plaintiff's

commercial structure and on the accused devices; and in doing so he necessarily implied that he was telling your Honor that the principles of patent law lead him to that
343 opinion. I think the scope of the cross examination should be as broad as that.

The Court: Anything further?

Mr. Carlsen: I still believe that this is going far beyond the proper scope of examination to examine Mr. Dugger on what Mr. Castner said in his oath, all of which is a matter of record, and can't be changed by the witness or altered or amended or interpreted by him.

The Court: Objection overruled.

By Mr. Ooms:

Q. Did you understand the question as it was read back to you, Mr. Dugger?

A. With the interruption I am lost at the present time.

Q. Let us see if we can't merely restate it. You did read yesterday from the specification of the Castner reissue patent a paragraph which was added and which had not appeared in the first Castner patent. That is correct, isn't it?

A. Yes, that is correct.

Q. And in view of the fact that that was put in the specification that then became, as you told us yes-
344 terday, a part of the specification which must be considered when you interpret the claim. I think you said that that was a necessary principle of interpretation, that you look at the specification, is that right?

A. I never said that.

Q. Well, is it?

A. No.

Q. You don't look at the specification to interpret the claims?

A. Why, certainly, you look at the specification, but that is not what you asked me.

Q. I am sorry if we differ. Let us see if we can agree upon it. You do agree in interpreting the claims you must look at the specification.

A. Yes, all of it.

Q. And the specification is the preferred embodiment which the patentee has disclosed to the Patent Office?

A. It exemplifies the preferred embodiment, yes.

Q. And in reading his claims you have guidance in the drawings and the specification?

A. That is correct.

Q. And when Mr. Castner added this paragraph
345 to the specification that became part of the textual matter by which he construed the claims, didn't it?

A. No.

Q. You can ignore it in interpreting these claims?

A. No, I did not say that.

Q. What part does it play in the interpretation of the claims?

A. I will explain my view of the portion in italics which appears in column 3, beginning at line 56, of the reissue patent. It reads:

> "Inasmuch as the sediment trap 28 is annular in form and extends entirely around the base plate, under and concentric with the agitator skirt, it will be seen that all areas of the dished bottom part 14 of the tub will drain freely and directly into the trap."

That is all that was added. Anyone looking at these drawings which appeared in the original patent will see that that is a statement of what is there in the drawings, and simply what will happen.

Q. You are now referring to the drawings in the Castner reissue and the Castner parent patent, aren't
346 you?

A. That is correct.

Q. And they are both identical?

A. Yes.

Q. Now, let us look a moment at the specification of this Castner patent, and the passage particularly in the paragraph preceding that which you just read from column 3, and I have before me the drawing from the Castner reissue patent, and I shall point out the numbers as you read them. Will you read that for me, Mr. Dugger?

A. Beginning where?

Q. On line 26, "The upstanding rim."

A. Yes, certainly.

"The upstanding rim 16 of the bottom plate of the tub forms a shallow, annular sediment trap 28 at the bottom"—

Q. Just a minute until I find the number.

A. I will help you.

Q. 28 here is the sediment trap.

A. (reading)

"sediment trap at the bottom, center of the tub.
347 Sedimentary material will be guided into this trap 28 by the inwardly and downwardly sloping bottom 14 of the tub and to facilitate the flow of such material into the trap I provide, in the construction here shown, a rim member 29 which is secured around the inner margin of the tub bottom where it is fastened to the aforesaid rim 16, and which is held in place by the screws 15. As clearly shown this rim member 29 extends inwardly as at 30 beyond the rim 61 and thus overhangs the outer marginal portion of the sediment trap. It should here also be noted that while the rim 27 of agitator skirt 26 is spaced above the rim 29, to permit the movement of sediment into the trap 28, the rim of the skirt extends radially outwardly be-

yond the inner edge of the rim 29 to thereby effectively cover the trap and prevent articles being washed from moving down into the trap. Such moving is
348 further prevented by the fact that the agitator is of the oscillating type wherein the vanes 25 produce a toroidal current which sweeps the articles outwardly over the rim 27 and thence upwardly in a general direction away from the trap, while the heavier sedimentary material finds it way inwardly down over the rim 29 to the trap."

Q. Now, it says inwardly down over the rim 29 into the tub, doesn't it?

A. Yes.

Q. In the Castner drawing, in following this description, it is a definite bottom portion which is inclined throughout its length from the curvature of the wall down to the lip 30 of this rim of the sediment trap, isn't there?

A. That is correct, in the drawing.

Q. It is in the drawing, and there is some language in the claims later about the rim deflecting upwardly, isn't there?

A. Well, let us get—if you want to call that language to my attention—

Q. Well, I will get to it when I get to the claims.

349 A. I know what you are getting to.

Q. Well, I am glad you do. But there isn't any question that the bottom portion 14, which is given a separate number from the number of the wall 12, is definitely dished and inclined throughout its full length in the Castner structure, isn't that correct?

A. When you are speaking of bottom, Mr. Ooms, we are talking about the bottom of the tub, and the walls are described as being dished, the walls of the tub dished in,

and they really reach out a little ways, and start up the bottom.

Q. Well, do you find anything in this patent about the wall being dished in?

A. I said, when you speak of the tub.

Q. The patentee is very specific in defining this portion that I have been pointing to as the bottom, and now I refer to line 30 and following in column 3 of the patent—

"the inwardly and downwardly sloping bottom portion 14 of the tub."

Q. Well, to answer your first question, you said where did I find any place where the walls were dished in. I will read it from column 7:

"said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap"—

Q. Does the word "dished" there modify the bottom portion or the wall?

A. The wall—

"having an inwardly dished bottom portion."

I am just a lawyer and engineer, not a grammarian, so in my humble opinion I think it modifies the wall.

Q. You think the wall is dished?

A. That is what it says here.

Q. That is the way you read it?

A. (reading)

"wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

Q. And when you use the words "wall" and "bottom" together, the wall is the vertical part of the structure, isn't it?

A. Well, following the curve around 14, it says—

"said wall having an inwardly dished bottom portion"—

in here some place. That certainly is not vertical.

351 Mr. Ooms: I move the answer be stricken as not responsive.

The Court: Yes, strike it.

By Mr. Ooms:

Q. When you use in describing a structure both the term "wall" and the term "bottom", the term "wall" refers to the vertical portion, doesn't it?

A. What structure are you talking about?

Q. Any structure.

A. Any structure?

Q. Yes.

A. I can show you a lot of walls that are not vertical.

Q. Or substantially vertical?

A. No. All you have to do is look at the quonset huts.

Q. Let us confine it then to our patents. Will you refer to column 2 of the patent and read the concluding paragraph, beginning with the words "the tub C"? Will you read it aloud, Mr. Dugger?

A. (reading)

"The tub C has a generally cylindrical wall 12 formed at the top with an opening 13 to receive

352 the clothes and water. The bottom 14 of this tub is somewhat bowl-shaped and slopes inwardly and is fastened, as by screws 15, to an annular upstanding rim 16 upon a base plate or bottom member 17."

Q. Now, you can stop there. There isn't question that the patent is using the term "wall" to describe the vertical part of the tub, and using the term "bottom" or "bottom portion" to describe the horizontal bottom, is there?

A. That is what it is here.

Q. That language also recurs in the claims, doesn't it?

A. Except the part that I read here from claim 4. It says—

"said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

Q. And the patentee has pointed out in the specification with the numeral 12 the generally cylindrical wall, has he not?

A. Yes, I read that.

Q. And he has used the number 14 to designate and identify the so-called dished bottom portion of the

353 tub, hasn't he?

A. Well, he said the bottom 14 of this tub is somewhat bowl-shaped and slopes inwardly.

Q. In the language I previously read you from column 3 he uses the terminology "the inwardly and downwardly sloping bottom 14 of the tub." We can agree on that, can't we?

A. Wait a minute. Where were you reading?

Q. Column 3, lines 30 and 31.

A. Yes, that is what he says about 14 there.

Q. Now, let us go on to your annular trap which you pointed out both in the drawings yesterday and in this structure Plaintiff's Exhibit 14 which shows the Beam design. He has a completely open trap at the bottom of the tub, does he not?

A. Well, it is not completely open, because at the rim—

Q. The rim does overhang?

A. I want to get the right number for you. 29 is the right number for the rim. It does overhang.

Q. The rim overhangs, but the sediment trap is open throughout its full circular length, isn't it?

A. I should say that it is open inward from that

354 edge 30.

Q. Well, any water running down at any point in that tub would go directly and freely into the sediment trap over the lip 30, wouldn't it?

A. Yes, that is right.

Q. And that is what he said in the passage that he added to his specification in column 3, isn't that correct?

A. Yes, I think so.

Q. And when he speaks of all areas of the dished bottom part 14 of the tub draining freely and directly into the trap, he is talking about a structure in which the trap is open throughout its full circular length?

A. Well, I can only read the specification, the words that are here. What is in a man's mind when he writes something, I don't know, but I read what I see.

Q. And you see the drawing and the structure.

A. I see the drawing, yes.

Q. And that is true of this structure, isn't it?

A. Well, let him read back your question. I think you said what he had in mind.

Q. I beg your pardon if I did.

355 A. I am sure you did say that.

Q. The specification so states, doesn't it?

A. Yes, that is right.

Q. Now, Mr. Dugger, I call your attention to one of the Norge tubs, one of the accused devices, Plaintiff's Exhibit 18, which happens to be before the Court here on the bench. I am correct, am I not, that there is a generally cylindrical wall which corresponds to the cylindrical wall in the Castner patent which he designates by the number 12?

A. I would think so, yes.

Q. And there is a bottom portion also in this tub, isn't there?

A. That is correct, and it is dished.

Q. Where is it dished? Would you point it out on the structure, or if you can describe it, describe it for the record?

A. I now have this Exhibit 18, the same as you were working with, and it has a uniform taper down to or approximately an inch or an inch and a quarter above the rubber gasket, and then it makes a turn, and I think it is fair to call that a dish. It is like a saucer or a dish, something like this.

Q. It is something like it, is it?

356 A. Yes.

Q. But it turns into a directly horizontal bottom, doesn't it?

A. Well, I can't quite see. It is a little hard to take a very short run like that, to know whether it is strictly horizontal or not; but it wouldn't make much difference in my opinion whether it is strictly horizontal or has a little slant on it.

Q. Even if it had a little slant up it wouldn't make any difference?

A. A little slant up?

Q. Yes.

A. No, I don't think so in the operation, not substantially.

Q. And then the bottom portion of the Borg-Warner tub rises as it approaches the middle of the base casting, doesn't it?

A. It rises about, I would say a quarter of an inch rise in here, slants sort of rounded, of course.

Q. Then it flattens out again in a horizontal run?

A. In the flange which lies over the bosses.

Q. Where does the bottom portion terminate?

A. Well, that is a question here.

357 Q. Now, answer that. Just tell us where it terminates.

A. If you had something that would write for sure on a

piece of metal of this type, that is a good idea. I am using a red pencil here, and I put the termination line where the holes begin because from there on down it is just a false bottom—from there on in, I should say, it is just a false bottom. It won't hold water beyond that point inside there. So where the holes begin the bottom terminates, in my opinion. I think that is a fair statement. I will go all the way around there, but you get the idea.

Mr. Ooms: The witness has drawn a red line at the outer edge of a series of holes in the horizontal bottom portion of the tub of Plaintiff's Exhibit 18.

By Mr. Ooms:

Q. Now, do you know offhand the size of those holes, Mr. Dugger?

A. Oh, they look to me about a quarter of an inch.

Q. They are a little less than that, aren't they?

A. Well, maybe. Well, I am inclined to think they are a quarter of an inch. They may be a little less,
358 but I have done a little machine work in my time, and a hole always looks smaller to me.

Q. They are about a quarter of an inch or a little less?

A. About a quarter of an inch, perhaps pretty close to it.

Q. And there are a number of them in a circular pattern around the whole bottom of the complete tub when you have a complete tub?

A. Yes, right over the sediment trap.

Q. Since you have the bottom terminating at this line outwardly of these holes at the bottom of the tub, what is this portion of the tub that goes on and is fastened to the base casting of the tub?

A. The bottom is terminated at the holes at that point. I have drawn the line so as to show it. I go from hole to

hole across here with the line which would if continued make a circle all the way around. Now, wherever the hole is the bottom terminates, that is, within that arcuate segment which is intercepted by holes, the bottom is terminated, just as surely as you cut it off. From there to the next hole it is not terminated, and that part is really an extension going on, and they hang a flange on it which is pierced, and the screws go through it, but it is not bottom any more, inside of this arcuate line is not bottom, because it won't hold water.

359

Q. I understood you to say that at the holes the bottom terminates, at the place you draw the line, but beyond the hole the bottom continues to be screwed to the base plate. Am I correct?

A. Now, let me draw some lines in here again; let me draw some lines in here again. It is a little hard to do because we are inside the tub. But I will draw them and show them to the Court. You can draw a line across here which intercepts the bottom. It is the arc that is intercepted by the diameter of those little holes, for each one of these. I don't know how many degrees of arc that is, but it is a certain number of degrees of the arc, and that would add up to a certain amount all the way around. Then the portion between the holes is not intercepted, and that reaches across; but I say where that comes down to the holes that is the bottom that is where she terminates, because the effective bottom is underneath there.

360

Q. So, you have an effective bottom where the holes interrupt the course of it, and then you have another bottom between two holes?

A. Well, beyond that is a false bottom, if you want to call it that; it is just like having a screen over anything.

Q. Well, now, Mr. Dugger, am I correct in this, that

the number of holes in here is not important from the standpoint of construing this patent?

A. The number of holes?

Q. Yes, of the kind that you have identified in Plaintiff's Exhibit 18.

A. I would say that it is not so much the number, but their effectiveness. If they are big enough to take sand and gravel through, and in the aggregate, and with the spacing that is on the inside of that flange, which I think is just a cover up myself.

Q. Excuse me. You just used a term "just a cover up". What do you mean, an evasion?

A. An evasion, yes.

Q. You think it is just an evasion?

A. I do, because they had to get water in there, inside of that flange, in order to let enough water go in
361 to replace the water that went out of the tube. My own feeling is that the holes are made to look purposely small, and then the water was let in the back door, so to speak, under the flange inside that hole, but they had to get the water in there, otherwise it would not work so good. It might work a little bit.

Q. You say it would not work as good?

A. Yes.

Q. You say there would be a difference in the degree of efficiency with which it worked?

A. It might work with just an increase in size of the holes a little bit.

Q. Did you ever try plugging up this inner rim?

A. No. When I ran it that was just like that, and, of course, when it is full, you cannot tell how much water is going through the hole and how much is coming in the back end.

Q. You cannot tell, can you?

A. Not by looking at it.

Q. The whole thing empties in what, five or six seconds?

A. Oh, I hesitate to name times, because my recollection of past events in seconds is not very good. It
362 does not take very long, let us put it that way.

Q. Did you put a stop watch on it?

A. No.

Q. You have operated these machines several times?

A. Yes.

Q. You are familiar with the way they operate?

A. Oh, yes.

Q. I think you said this morning that the use of the holes with this so-called false bottom would keep out things like buttons and bobby pins. That is correct, isn't it?

A. Yes, it is like a screen over any trap; it keeps the large objects from going in.

Q. It keeps the clothes from going into the sediment trap, too, doesn't it?

A. I don't think the clothes even get close to those holes, because the rim of the agitator goes over it.

Q. Not completely over, as you pointed out?

A. Well, there is a space, but as nearly as I can figure out from that exhibit the outer diameter of the base of that agitator is almost in line with the point of the hole
363 which is at the farthest point from the axis. It is a little difficult to say, but when you put the hole in there you measure from the center of rotation out to the point of the little hole which is farthest from the center of rotation. It looks to me like you can just see the hole, just a tiny bit of the edge of the hole.

Q. You did put the agitator over some of these tubs?

A. Yes, but it is a little difficult, Mr. Ooms, because there is no way to center that thing real close. You see, it comes around here a little bit, and you cannot be sure of your center. What you have to do, what I tried to do, was to see whether I could get a uniform visibility around there so I could tell when I was on the center, but you cannot be just real close from these exhibits.

Q. Do you know how far the agitator skirt is above the bottom of the tub when the machine is running?

A. No, I did not measure that.

Q. The skirt of the Castner patent, which is on the easel here as Figure 1 of the Castner patent overhangs the complete annular channel or sediment trap, doesn't it?

364 A. Yes, sir.

Q. And he in his patent points out that he keeps the clothes out of this trap by having this skirt extend beyond this lip portion 29 and 30?

A. That is correct.

Q. Now, you said something about this device being an evasion. You heard the testimony here, did you not, that some of these Beam devices are built without a tube from the sediment trap.

A. I did hear that.

Q. And you will agree, I assume, with counsel and me and everybody else, that in that case there is no possible infringement of these patents.

A. Well, Mr. Ooms, I never have been asked to pass upon that question. I just never have thought it out. Whether there could be any possible infringement, I don't know.

Q. Each claim calls for a tube, doesn't it?

A. Well, I think so.

Mr. Carlsen: No, it does not.

Mr. Ooms: Each claim in suit does not call for a tube?

Mr. Carlsen: No.

Mr. Ooms: Which one doesn't, Mr. Carlsen? I may
365 have misspoken.

Mr. Carlsen: Well, I don't want to take the time.

By Mr. Ooms:

Q. Well, the point I am getting to, Mr. Dugger, is when you don't tube it out, sediment collects in the trap 28, does it not?

A. I would suppose so, but I have never seen one of those machines operate.

Q. You can very readily clean out that trap by just lifting the agitator off, and getting a tool, and cleaning out the trap, couldn't you?

A. I suppose so. It might be a little hard to do.

Q. How would you do that in this Borg-Warner tub, Plaintiff's Exhibit 18?

A. I don't think you could there. It would be awfully hard to do it anyway.

Q. Now, Mr. Dugger, I would like to go over some of these charts that you used this morning.

Mr. Carlsen: Before you do that, Mr. Ooms, I would like to call attention to the fact that claim 5 does not call for a tube.

366 Mr. Ooms: What does it call for as a discharge device?

Mr. Carlsen: I will have to read the whole thing. It does not call for a tube. That is the only question I was asked.

By Mr. Ooms:

Q. It does call for a means for discharging the recess, does it not, Mr. Dugger?

A. Oh, I am sorry. I thought you were talking to counsel.

Q. No. We can agree on it. It speaks for itself.

A. Whatever is written there, that is what it calls for.

Q. Now, Mr. Dugger, you said you did run some of these machines. Did you ever make any measurements or calculations as to the force with which the water leaves these machines from these tubes?

A. No, I did not.

Q. Did you ever make any studies or measurements to determine how much additional force is provided when you use the spiral tube of the Roth patent as compared to the straight tube of the Castner patent?

367 A. No, I have not. My testimony on that was what I perceived in the device as a physical device. I am sure there must be some element of additional tendency for the water to go out due to the acceleration force and the mass of water.

Q. Have you ever seen the third type of tube that the Beam Company uses to empty these sediment traps, the tube that is vertical and then runs a short distance horizontally at its discharge end?

A. I don't believe I have seen any but just what is here.

Q. Did you know that they haven't made any of these since sometime in 1954?

A. I do not know that.

Q. Let us start with your Chart A, Mr. Dugger, which is Plaintiff's Exhibit 20. Do you have it at hand?

A. I am looking for it right now. Yes, I have it.

Q. Now, Mr. Dugger, I call your attention to the element in your broken-down claim 4, which you have designated as (c), which reads:

368 "said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap"—

Now, that is speaking of a wall 12 of the design, is it not?

A. Yes, it is the thinner element of the tub which comes down and curves on in there.

Q. Then when you get to the bottom portion, the specification remits you to what is designated with the number 14, doesn't it, the dished bottom portion?

A. Yes.

Q. And it is this dished bottom portion which the claim says terminates in a depression. What does the word "terminate" mean?

A. Well, the normal meaning is that it ends.

Q. And in the Castner patent, both the specification and drawings, the bottom portion actually ends with the lip 30 above the sediment trap, doesn't it?

A. Well, I—

Q. I beg your pardon. Yes or no.

A. I can't answer that truthfully yes or no. I want to explain something.

Q. Let us first have the answer and then the explanation.

369 A. The answer is no.

Q. Then you may proceed with your explanation why it does not.

A. May I have the pointer, please?

Q. Yes.

A. In this particular mechanical construction the upper thin piece of metal 12 is carried down here, and comes out with a little flange, which is held between two gaskets; then it is clamped down by a ring 29 by some screw that go into this rim which is 16 on the base casting.

Now, so far as the tub is concerned, this ring here is just as much a part of the wall as any other part. It really goes right along there, and it might even be, if you did

not care about manufacturing technique or anything, you might make it in two parts, one piece, which carries it right on out there. If you did not care whether it leaked or not, you could screw it to this thin sheet metal.

Q. But you don't disagree with me then that the bottom portion, and I said including the lip 30, the bottom portion does terminate in the lip 30?

A. The bottom portion of the tub?

370 Q. Yes.

A. The bottom portion of the tub does not terminate any place. It goes all the way across, or it would not hold water.

Q. Well, as I read this claim, Mr. Dugger, maybe you can explain this element to us—

"said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap."

A. The bottom portion terminates, but the bottom does not terminate. Maybe I misunderstood you.

Q. But there is a definite termination at this lip 30 of the bottom portion, and that lips extends the full circumference of the sediment trap, is that correct?

A. Yes, that is right.

Q. I think when you described this this morning in its operation, and you had charted some blue arrows going like the small arrows in the upper part of Figure 1 of the Castner patent, you said that the sediment trap would continue to fill with water and continue to discharge water after the spinning started. Do you know how long it continues to fill with water?

371 A. No, not in seconds, but I can tell you in function how long it will continue.

Q. How long is that?

A. It just depends on how much water you have in the

tub. Now, these little dotted arrows at the top of the drawing illustrate about the shape of the water after the tub starts to go, but not too much afterwards. You see, the faster it goes the deeper will be this hollow down here. It really is not a vortex. The reason a vortex is water that is swirling like that. This is more like a vortex, whirlpool, but it is something in the shape of a vortex. This really due to the relative forces, because out here there is a high centrifugal force and a lesser one here, because the radius is less. I think that is correct. At any rate, as this tub speeds up, the center will go down farther and farther. Now, some of it is going down here. Meanwhile some of it goes out here. What goes out this tube is replaced by some more that comes in here, otherwise it can't come out, it will draw a pocket here.

Q. As long as there is water over the trap, it will continue to run out?

A. Yes, I think so, because you have the 372 weight of the atmospheric air pushing down on here.

Q. Are you sure that it is?

A. Well, that is what I think it is. It may be somebody else has got a different idea.

Q. It takes a few seconds for the thing to empty?

A. I would say it was probaoly under ten seconds.

Q. Now, would you agree with me, Mr. Dugger, after you start spinning the centrifugal force drives the water outward toward the wall?

A. It drives it outward.

Q. And with considerable force?

A. Yes, depending on the speed.

Q. And the force is sufficient to have the water climb over the wall of the tub?

A. That is correct.

Q. The water never moves in a direction toward the middle of the tub after the centrifugal force becomes effective in the machine, does it?

A. Well, there you are getting into something that is awfully hard to say, because the machine is full of clothes, and you can take maybe a tub with no clothes in it, and say this particle of water is not going to go any place but out; but here you have displacement due to the shape of the agitator, which may be free wheeling. I guess some are free wheeling and some go around with the tub. I won't say they can't move down as well as out a little bit.

Q. I did not say down; I said inward.

A. There may be some swirl or something that takes a little of it in, one particle of water, but generally it wants to get out.

Q. All I am getting at, Mr. Dugger, is that this final element which says that the tube permits the discharge of the sedimentary matter from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along over the tub wall, contemplates that you are having water moving outward through the tube and out over the edge.

A. Yes, it is true.

Q. You mentioned a pump. It is not pumping in any other direction?

A. No, it is all going out of the tub through one or the other of those things. When I say one or the other of those things, it should be one or the other those paths. That is a little more descriptive.

Q. That is all right. I think you did point out in your testimony yesterday that while the Castner machine, the Castner patent and the Beam machine had the

two tubes, that it was a matter of indifference whether you had one, two, three or four, as long as you had one outlet for the discharge of the sediment.

A. Well, perhaps I said that. If so, I don't think it is quite a matter of indifference. That must cause something, and maybe two will do the work a little faster than one; but if one works fast enough, that is enough. I am not close enough to the fine points of manufacturing.

Q. I don't mean the economies. I mean as far as the law is concerned, it is a matter of indifference whether you have one, two, three or four?

A. Well, the patent says at least one.

Q. And that, under patent law, contemplates if you have two or three, you don't change the principle?

A. That is the way I figure it, yes. If you have one and somebody else has two, well that ought to do, if you have at least one.

Q. May we again agree on this, too, Mr. Dugger,
375 as to the matter of balance, even though Mr. Castner shows no balancing ring, the matter of balance is important and elementary in the spinning tubs.

A. I guess it is important, but there again I know that tubs have been made that were centrifugal extracting machines and they did not have one single solitary balancing weight on top.

Q. Domestic washing machine?

A. Yes. My mother had one when I was in college, which was called a Laundryette, great big 24-inch machine, vertical oscillator and centrifugal extractor, nice copper tub, not any weights at all. It would vibrate to beat the band, but she did a lot of washing in it.

Q. How long ago was that?

A. I got out of the University of Illinois in 1926. It must have been 1924 or 1925. It was a long time ago.

Q. Let us again agree on some of these things. The idea of the spinning tub to take water out in domestic washers is not new with Mr. Castner?

A. Oh, no. Just the idea of spinning your tub around to take the water out?

376 Q. Yes.

A. No.

Q. And the idea of using a tapered wall to get the water to climb over more readily isn't anything new with him?

A. There you are going into prior art, and I did not study the prior art last night because I thought we would not get into it today.

Q. I am not going to examine you on the prior art now, but you were careful when you read these claims on the structure to go through all of the elements, and I would like to avoid duplicating that. So if I can just get your agreement on some of these things, so I can confine myself to the novel features of the Castner structure—I think you will agree with me that the tapered wall was known.

A. I think it was. I would not be real sure. I would have to confirm it.

Q. You told me the spinning idea was old.

A. In the oldtime tub mother had, that was not an imperforate tub, that was a perforate basket, and naturally it sent a lot of water outside of the tub and cleaning space, too.

377 Q. You don't suggest the imperforate tub was new with Castner?

A. No.

Q. Talking about the matter of two tubes or one, and whether that was a matter of indifference, it is true the design has to be in pretty fair balance to operate successfully, doesn't it?

A. If I had not seen this old machine of mother's, twenty-five or twenty-seven years ago now, operate, I would have said that ought to be balanced pretty good; but that thing used to shake like a terrier shaking a dog, and yet, she used it month after month, several years, perhaps many years, and the thing always stayed together.

Q. Do you know whether the speed compared with the speeds we use today?

A. I have no idea. It was thirty years ago.

Q. Let us go back to these claims, Mr. Dugger. I think the first of the charts in which you attempt to read a claim on one of the Norge devices is Chart C, Plaintiff's Exhibit 22, which you read on the drawing and also on Plaintiff's Exhibit 18, and I think you pointed out that several of the features of this claim were found in the Norge
378 structure, but I would like to begin again with the element (c).

I have here a large reproduction of the drawing you put on this chart, only I have colored the tub yellow and the tube red and the sediment trap green, but you recognize the disclosure, do you not, sir?

A. Just a minute. I think I have a corresponding exhibit number. I think is it, isn't it?

The Court: 22 you have. I mean, that is C.

A. Yes, I recognize the structure.

By Mr. Ooms:

Q. This is found in 22 in its entirety, I believe.

A. Yes.

Q. On that one we have the (c), and there we raise that question of the wall. I think when you were talking about that claim you talked about the wall terminating in what you said was an effective termination at this row of holes above the sediment trap. I think that was your language, wasn't it?

A. You did not when you were discussing the claim distinguish between the wall and what the claim
379 calls an inwardly dished bottom portion, did you?

A. Well, the way I have it broken down in Exhibit 22, you will see that phrase (a) says "a rotatable, tub." Now, there are two principal modifying phrases—

(b) "an imperforate upwardly flared side wall"

which does the things in (bb)

"operative,"

and so on. And (c)—we are still talking about the tub—it is the "tub having"—

"said wall having an inwardly dished bottom portion"—

so it is the wall having a portion terminating. That would be the way to interpret that language. I think that is proper.

Q. You want to ignore the words

"bottom portion terminating in a depression"?

A. No, I said, you would say—

"a rotatable tub having an imperforate upwardly flared side wall * * * said wall having an inwardly dished bottom portion terminating"—

380 It is the portion terminating.

Q. On the discussion before, where you drew the red line joining the series of holes would be your statement of why you say the wall or the dished bottom portion of the wall terminates in a depression?

A. That is correct.

Q. And you would in that reading completely ignore all parts of the tub bottom that extend inwardly of the row of holes that you have referred to?

A. No, I did not say I would ignore them. I said from that point on over. I said from that point on over since it was really within the perforated circle, it acted as a screen,

which is what it acts as and it forms a mounting flange. It is a good mounting flange, I think; it is quite solid, it must be; but it is not a good bottom portion of the wall any more, because it lets the water through.

Q. It will let water through at what point?

A. At those holes, and also over the side of the flange, the way it is mounted.

Q. And you say therefore it is no longer a good bottom portion of the tub?

A. It is not an effective—I use the word good
381 in the sense of effective.

Q. When you use the word "effective," you mean effective for what purpose?

A. For its intended purpose.

Q. And what is that?

A. Well, the bottom of a tub is to hold the water in it. It is not effective as a bottom unless you have a bottom in it that is watertight. The bottom of that tub is the bottom of the trap actually.

Q. Well, would you say that that structure is effective to accomplish what Castner put into his reissue specification, when he said

"all areas of the dished bottom part 14 of the tub will drain freely and directly into the trap"?

A. Yes. I will tell you why.

Q. Go ahead, tell us why.

A. All right. Now, you don't have to have a very big hole in the bottom of the tub to let the water run out, even though the bottom is fairly flat and level, because water will seek the opening. You can't pile up much water; it will find the hole and go out. And here is what you have here, you have a lot of holes around there, and the water
382 is going to run right smack down through those

holes, and they are going to take gravel and grit with them.

Q. You are talking now about the fact that water does run down by force of gravity, but the patent says that because this trap is angular, and I read the language of the patent to you, all areas of it will drain freely and directly into the trap. Do you call that flowing or draining directly into the trap when it has to hunt a hole to do so?

A. Well, it is not going to drain any other place.

Q. Is it going to drain directly into the hole?

A. Sure, it is. I think so.

Q. Even though it has to hunt around the bottom to find the hole?

A. It has what I say. I think it drains directly.

Q. The answer is yes?

A. The answer is yes.

Q. Mr. Dugger look at Chart F, Plaintiff's Exhibit 25, in which you have broken down claim 5 and applied it to both the Castner construction and the Norge first design I drop down to element (c) where you again find that language, but here without the reference to the bottom
383 portion, the language that the side walls curved inwardly at their lower ends and terminate in an annular recess. I assume if I asked you the same questions about that element (c) that I asked about element (c) in claim 4, your answers would be the same?

A. Yes. I think there is a little additional explanation that I can give to you.

Q. Go ahead, sir.

A. If I may have your pointer. Refer to your exhibit, you can think of termination in any direction. Now, the walls they are talking about there as they go down, they say that they curve in, and the wall terminates in a downward direction. It says:

"said side walls curving inwardly at their lower ends and terminating in an annular recess adapted to receive liquid and sedimentary material during the washing operation."

Now, if you think about it as terminating in a downward direction, just as the tub does, the tub has width and height, and terminates in a downward direction.

Q. Terminate means to me ends. Does it have that
384 meaning to you?

A. Yes, that is the normal meaning.

Q. If you use this last meaning of the wall terminating, as you said, in a downward direction, where does the wall in the Norge first design shown on your chart on the easel terminate?

A. May I mark it for you?

Q. Certainly.

A. I will take my ball point pen again, and it terminates as the wall right here. I am putting a mark on Figure 1. Is this an exhibit, Mr. Ooms?

Q. No, it is not.

A. Maybe we had better put it on an exhibit.

Q. Let us put it on your chart, if we can borrow it from his Honor.

A. It is not big enough. There is a better exhibit that shows the figure a little bit bigger.

The Court: Is it one of these?

The Witness: No, I think it is Plaintiff's Exhibit 1 or 3.

By Mr. Ooms:

Q. I am handing you Plaintiff's Exhibit 1, Mr. Dugger.

A. Working from this Plaintiff's Exhibit 1, now
385 there you have the wall coming down. It curves in at the place that I have marked 12, and it terminates in a downward direction at this trap. Well, you can

say it terminates like here, like this, at that level, sir, at the level of the top of the gasket.

Q. You have drawn a line. Does it go through the holes, or where is it with respect to the holes?

A. What I intended to do, and I think I came out all right, it would be the bottom of the curve, it lays right on top of the gasket. It terminates in a downward direction at that trap.

Q. So now you would move the termination of the wall slightly outwardly from where you drew it on Plaintiff's Exhibit 18, is that correct?

A. Well, there I was figuring the termination as coming right approximately the same place. You see this gasket? When you press it down it sort of draws.

Q. And you would make the wall terminate at the point where the horizontal portion of the bottom of this tub Plaintiff's Exhibit 18 meets the gasket which is between it and the base casting?

A. Would you repeat that question, please?

386 (Question read by the reporter.)

A. At that level, yes.

Q. Then let us move on to the next element of claim 5 as set forth in your chart, Plaintiff's Exhibit 25. That element (d) begins:

"a circular flange extending inwardly over the outer part of the recess to produce a horizontal separation of liquid during the spinning of the tub"—

Now, where is that circular flange?

A. Well, on the accused structure they have made two parts as one. I am referring to Plaintiff's Exhibit 1. Now, the flange part is the part that extends radially inward from where the curved sheet metal shelf contacts the rubber gasket, and I am putting some marks now at this

point right here, some blue marks up and down, and then I will put a dimension line on there like this. That is the part I call the circular flange.

Q. Now, you have drawn two parallel vertical lines.

A. Excuse me. My pen is not writing. I have another one. O.K. All right.

387 Q. You have drawn two parallel vertical lines, one rising upwardly from where the bottom meets the rubber flange, and the other rising upwardly from the outer margin the perforations in the bottom, is that correct?

A. That is right.

Q. And you say that the part of the bottom which is between those two is the circular flange which is described here?

A. Yes.

Q. Now, this describes the circular flange as—

"extending inwardly over the outer part of the recess."

As a matter of fact, the flange in the accused device shown in Plaintiff's Exhibit 1 extends between the holes and inwardly of the row of holes, doesn't it?

A. Well, you have to think now about what happens when you get over here in this hole (indicating). I don't want to mark your drawing, but I will point to the holes, and I have drawn on Exhibit 18, the physical exhibit, some lines in here like this. Well, they would be radial lines intercepting the axis. That is one I intended to draw.

388 Now, I am considering what this thing is at the hole—at the hole.

Q. Now, Mr. Dugger, the claim proceeds and has a whereby clause about this circular flange, and says—

"whereby the main body of liquid adjacent thereto will be deflected upwardly and whereby the liquid and sediment below the inner edge of the flange will be

restricted to the space in the recess below the level of the flange."

Now, I want to talk about that upward deflection. Where in the Norge machine do you find anything about that circular flange as you have identified it that would deflect the liquid upwardly?

A. I will show you; and if I may have an exhibit, I will draw it on there. What I would like to have is a bigger piece of paper, because these views are rather small.

The Court: What about this?

The Witness: That will be fine, your Honor.

By the Witness:

389 A. (continuing) What I want to do, so we can all see here, I will work up here.

By Mr. Ooms:

Q. Show his Honor while you do it.

A. I am going to. I am going to try to draw this little piece here, sketch it much bigger, so we have something to work with.

Q. You are going to draw something like shown in figure 3?

A. Even more than that, bigger. The sheet metal comes down here like this. It runs out a little bit here. Then the hole goes over here. There is the fastening with the nut on it, the capscrew. Now, Mr. Ooms, if you want to come here, I will draw these things and talk about them at the same time. This is the sheet metal here, coming across here. I am cross-hatching it, and it is made much bigger. There is the diameter of the hole, and I have not cross-hatched it there because that is the hole. Now, you will understand this metal in the back here, away from the boss is cut away, showing fluid coming down, here in Figure 3 of Exhibit 1.

390 Now, the circular flange part is this part in my opinion—well, it would be right by the gasket, running inward to the hole. That is this dimension. That is the same as I put on there before. This is the flange.

Now, you have water in the trap and above the trap; and when this thing turns around like this, the water wants to go over to the left side of the page. Let us take a particle of water right here. I am going to call that UP for upper particle, and that is going to want to run over here, and it is deflected upwardly as shown by the solid area.

Another particle of water down here, which I will call LP for lower particle in a little box, is going to be thrown out this way, and it will lay against the wall of this trap until sooner or later it runs around until you get to the hole in the trap. It is connected on the tube, and then goes on up.

Here is what happens. When you have centrifugal force you have something that is just like gravity only it is possibly more dependent on how fast it goes, and the water will run out against the wall of that trap, and it
391 will flatten out against the wall, try to press against the wall, just like gravity pulls water down on a flat table top, and it will run as far as it can run until it finds a hole. So the water runs out against the rim of this trap until it finds the hole, which is the tube hole, which comes on up, and then it runs on out.

So, these are the arrows, deflected outwardly and upwardly, and I will mark them with outward and upward arrows here. And the separation here, that little box which represents the particle of water, we will call it the upper particle; from the little box which is LP, we will call it lower particle.

Q. And with the sketch you have just drawn, Mr. Dugger, your explanation is that the thing that deflects

the water upwardly, if I may use the plain language, upwardly at the circular flange is actually the curve which joins the horizontal bottom to the vertical wall of the tub; that is correct, isn't it?

A. Well, that is in the background, but it is like wind hitting a hill. The wind will move up before it gets to the hill, and I am sure that is what would happen
392 here, because there is already water outside the tub, and the water that is back here will hit the water that is toward the curve, and the water toward the curve will be deflected upward. It is just like an upsweeping wind hitting a hill.

Q. Now, as a matter of fact, that particular area that you have drawn your arrows in is filled with clothes at the time the spinning begins, isn't it?

A. Clothes and water.

Q. And the clothes are there, and the water is thrown against the clothes and climbs up over those, doesn't it?

A. Yes.

Q. But now, as you drew this, it was not the flange that you identified between the two vertical lines that deflected the water upwardly, but it was the curvature of the tub at the junction of the bottom and wall, wasn't it?

A. Well, it was the flange that produces the separation, and then they go on out and go up, the upper flow deflects on up.

Q. Let us look at the Castner patent drawing a moment, Castner reissue patent. I have Figure 1 before
393 me on the easel. In the Castner patent the bottom portion of the tub is actually inclined all the way to the lip 30 which overhangs the sediment trap, isn't it?

A. That is right.

Q. And because it is inclined, as soon as the water

strikes that inclined surface, it is deflected upwardly, isn't it?

A. Well, yes.

Q. And long before it reaches the vertical wall of the tub?

A. Yes, I think possibly so. It has to; it can't go straight out; it has to go up a little bit.

Q. And it is positively deflected upwardly by this inclined dished bottom portion of the tub terminating in the annular lip 30?

A. It certainly must go up, because it can't go straight out.

Q. Well, that is what does it in the Castner device, isn't it?

A. Sure, and I think there is also this same effect that I told you about.

Q. But in addition, when you get beyond the sediment trap and the lip thereof, you get the same thing you have been describing as the upward deflection in the Norge device?

394

A. Yes. May I explain this? You have to think about what happens here in this separation, and the discharge from the tub at the beginning, the middle, and the end. When the tub is full of water and the spinning just begins, the water is going to be a little lower in the middle than it is at the edges, and follows all along the dotted areas; but there is a separation in the flow way down underneath the tub. The separation, this flange, is just like a cutter plate that cuts those two flows, one direction and the other. The flow below the flange goes through the trap and out the tube; the flow above the flange goes up. Now, that would be what happens if the flow was restricted on the tube, and due to the fact that these two throw quite a bit

of water, depending on how much they throw, there may be some actual throwing down there.

Q. Now, let us get back.

A. I never measured the quantity, so I don't know how much.

Q. But you will agree with me in the Castner
395 drawing you have down on this lip 30 the beginning of a positive inclination on the dished bottom portion of the tub before you get to the curvature which joins the bottom with the vertical wall of the tub?

A. That is unquestionably true of that drawing.

Q. And you said something there, that regardless of the curvature which joins the bottom of the tub to the vertical wall, that gives a positive upward deflection to the water?

A. Will you repeat that question?

(Question read by the reporter.)

A. Would you want to rephrase your question perhaps? I am not sure I understand it.

The Court: Suppose you rephrase it.

By Mr. Ooms:

Q. In the Castner device, in addition to what you described as the upward deflection of the water when it strikes the curved junction of the bottom of the tub with the vertical wall, you have an annular lip and an inward dished portion of the bottom of the tub, which gives a positive deflection to the water before it ever gets to the curved junction of the bottom and wall.

396 A. Yes, that is right, because it slants up.

Q. Now, let us look at the next element, which is the one in (e)—

"means for preventing materials being washed from entering the recess with the sediment."

Now, in Castner you described that as the overhanging skirt of the agitator, doesn't he?

A. I believe you are correct, but I am going to check it.

Q. Look in column 3, lines 40 on.

A. Yes, that is right.

Q. Now, in the Norge accused structure you have an overhanging agitator skirt, but you also have a complete covering of the sediment trap with the perforated bottom of the tub, don't you?

A. That is correct.

Q. And if you took the agitator out of the Castner machine, your sediment trap would be open and clothing, bobby pins, anything else, could get in there, couldn't they?

A. I think they do sometimes.

Q. And if you lifted the agitator from the Norge machine, you would still have the perforated bottom
397 serving as a means for preventing material from entering the recess with the sediment?

A. Yes, I think they have a screening effect.

Q. Now, Mr. Dugger, you have used the term gravel, and you have referred to bobby pins and buttons. I don't think Mr. Castner in his patent refers to gravel among things that accumulate in that sediment trap, does he?

A. I cannot answer without reading the specification, but I will do so.

Q. No, don't bother with it now. As a matter of fact, it is sand and heavy dirt that comes off the clothes, isn't it?

A. Well, it is sedimentary material. In the cuffs of my pants I might have gravel and a lot of other things.

Q. Have you ever examined the discharge from or the collection within one of these sediment traps to see how much material does accumulate there in a washing?

A. No. I examined the discharge from the whole washing machine to see whether the sedimentary material got out of the washing machine.

Q. And it got out?

398 A. Yes.

Q. It is a small quantity, but it gets out successfully with this type of device?

A. The Castner device and also the Norge device.

Q. Well, it would get out of any device that collected it at the bottom of the machine, and had a tube that led from the space in the bottom to collect it when you spun the tub, wouldn't it?

A. Well, I tested the Beam type machine—I don't know under what trade name.

The Court: Just answer the question.

The Witness: Well, he said any type. I only tested Norge and Beam.

The Court: What about them?

The Witness: They do, they get the gravel out.

By Mr. Ooms:

Q. But as an expert, there is nothing peculiar about these two structures that you would not find in any spinning tub wash machine that had a trap in the bottom to let this heavy dirt fall, and have a tube that led from that trap so that material could be discharged when you spun the tub by centrifugal force.

A. If it is a part of the machine it would do it,

399 but you said any.

Mr. Ooms: I move to strike that.

The Court: Yes. Answer the question.

The Witness: I cannot answer it.

By Mr. Ooms:

Q. Then I fear you are not an expert. You mean to tell us you cannot say yes to the proposition that any one, any tub structure like this, whether it is a wash machine or a sugar extractor, that had a pocket in the bottom into which the heavy material would flow, and had a tube lead-

ing from that pocket, would not discharge that heavy sediment when the tub was spun centrifugally?

A. I am sure I could fix that machine so it would not discharge.

Q. Answer my question.

A. I will answer it that way. The answer is no, I am sure that they won't. You have asked me about the structure, and I gave you an answer on the structure.

Q. Your answer is the structure I described would not empty the sediment centrifugally when the tub was spun?

A. Not if it has to be a big sediment. You can't
400 put rocks in there. You said about rocks, sugar and some other things.

The Court: It is much ado about nothing. The form of your question on that.

Mr. Ooms: I agree, but I think the question was entitled to a yes answer.

The Court: Well, I think so too, or "I don't know," one or the other.

The Witness: Well, I don't know.

The Court: All right. That is an answer to it.

Mr. Ooms: Do you want to recess for the night?

The Court: Yes; until tomorrow morning.

(Whereupon an adjournment was taken to 10:00 o'clock a.m. of the following day, April 26, 1956.)

* * * * *

402 RALPH L. DUGGER, a witness on the part of the plaintiff, having been heretofore duly sworn herein, resumed the stand and testified further as follows:

Mr. Ooms: Your Honor, the sketch which the witness made yesterday has been marked Plaintiff's Exhibit 46, and

the defendant has no objection to it going into evidence at this time.

The Court: All right.

(Plaintiff's Exhibit 46 was received in evidence.)

Cross Examination by Mr. Ooms.

Q. Mr. Dugger, I have a few questions with respect to your Chart G, Plaintiff's Exhibit 26, in which you apply claim 8 of the Castner reissue patent to the structure of the accused design. Do you have that before you?

A. Yes, I have it, Plaintiff's Exhibit 26.

Q. I am going to refer only to the element which you have marked (cc).

Do you have that?

403 A. Yes.

Q. Now, I note that that element concludes, after description of the depression, with a "whereby" clause which reads:

> "* * * whereby sediment may drain radially inwardly from all parts of the bottom portion and into the sediment trap"—

Now, in the Castner device that is possible because you have a dished bottom terminating in an open sediment trap, isn't it?

A. Yes.

Q. Now, how does it drain radially inwardly from all parts of the bottom portion into the sediment trap in the accused structure which is shown on the drawing here?

A. It comes down the wall around the curve and into the hole.

Q. How about the water that is overlying these holes, and that is lying inward of the row of holes toward the center of the tub? Does that drain inwardly?

A. It would not drain inwardly.

Q. It does not drain radially, does it?

A. No.

Q. Now, Mr. Dugger, one question about this
404 Castner patent structure which shows the two tubes and the eccentric sediment trap, such as were built in the first Beam machine, which is in evidence here as Plaintiff's Exhibit 14. With that eccentric sediment trap, if you use only a single discharge tube, the sediment would accumulate in the other eccentric portion of the trap, wouldn't it?

A. In Figure 5 of the Castner patent there is shown a somewhat oval-shaped sediment space or trap. Now that oval is arranged concentrically to the axis of rotation. The oval is concentric, because an oval has a short axis and a long axis; and as nearly as I can tell it is concentric with the axis of rotation.

Q. But it is not a circle, is it?

A. No, it is not a circle.

Q. And to the extent that you do have an eccentric portion which extends beyond the innermost outer edge of the sediment trap, upon spinning of the device, if there were no tube on one side, sediment would accumulate there, wouldn't it?

A. I think probably not, for this reason: There is a drawing of water from the trap, and I really do not know whether the draw towards the tube—may I have the
405 pointer, please?—would be only in one direction; but I think it would; I imagine where there is a strong outflow of water into the discharge tube 32, the flow has to come from some place, and it will come around both ways, I believe.

Of course, this is going around in the base, and where

the water is going around as fast as the tub, I cannot say; and if there were a relative motion of the tub with reference to the water in the trap, it might disturb that divided flow coming around both ways, and perhaps more in one way than it does the other.

Q. When the centrifugal force is effected in this spinning, none of this water is ever going to be in a position closer to the center of the tub than it is at the moment, is it?

A. Probably not. But the trap is full, the trap is full of water.

Q. And any part of it that is nearer the center of the trap than the pocket that is formed by this eccentric portion will move over, but that which is in the eccentric portion will never go any other way than toward outside of the machine, will it?

A. I won't say that, because I think that it might very well be a sufficient flow within the trap to dis-
406 turb that statement, to make your statement incorrect.

Q. And you think sediment would not collect in that eccentric portion of the trap?

A. I don't know for sure. I have never seen one run with only one tube.

Q. You have never run one of the Beam Company that had no tubes at all, have you?

A. No.

Mr. Ooms: That is all.

The Court: Anything further?

Mr. Carlsen: No re-direct examination.

The plaintiff will rest.

(Whereupon the plaintiff rested its case.)

407 (Thereupon the defendant, to maintain the issues on its part, offered and introduced the following evidence:)

Mr. Ooms: The defendant would like to offer at this time the prior art patents which are collected in the yellow book. I think we presented your Honor with a copy. In view of the fact that I am putting in no testimony with respect to these, I would like merely briefly to point out the passages in these patents that the defendant is relying on.

I will have the reporter mark as Defendant's Exhibit A, the King patent No. 974,075, as showing the state of the art with respect to centrifugal separators; and in that patent, which is for an ore concentrator and not a washing machine, we rely on the passage on page 1 of the patent, column 2, lines 60 to 82, and I merely refer to what the patentee says about the grooves colored in red, which are also in the chart book of which your Honor has a copy.

> "These grooves are not absolutely straight in the vertical direction but are curved slightly in the opposite direction to that in which the bowl is rotated,
> 408 being equally spaced from each other, and, in the example shown, being six in number. The purpose of these grooves is to lead the concentrates upwardly to said discharge openings."

As Defendant's Exhibit B, we offer in evidence the Wright patent, No. 1,850,821, which is for a washing machine. We rely on the passage on page 1 of the patent, column 2, lines 51 to 74, and on page 2 of the patent, column 1, lines 9 to 49. I merely point out in the drawing that these tubes which empty the washing machine by spinning it, as the patent points out, and the lower diagram Figure 2 shows, that the inlet portion of the tube leads and the discharge portion of the tube trails.

As Defendant's Exhibit C, the defendant offers the patent to Dunham, No. 2,274,402, which was cited by the Patent Office against the Roth patent, and brought to the

attention of the Patent Office by Castner when he sought his reissue patent; and in that patent, your Honor, we refer to and rely on the passages on page 1, column 1, lines 1 to 4, which describe this as a washing machine with a centrifugal dryer.

409 Page 1, column 1, lines 33 to 39, which speak of the tub being of imperforate walls and tapering outwardly.

Page 1, column 1, line 54 to line 9 in the second column, which describes the channels colored red and green on the colored chart, which the patent calls channels with a receptacle below the liquid level; and later speaks of it, in column 2, page 1, lines 21 to 30, as collecting the sand which drops through the opening 22 and spins it out when the washing machine is spun.

We also rely on column 2, line 47, and column 1, page 2, the first four lines; and then on page 2, column 1, lines 46 to 62. We call attention to the fact there that the tub has a horizontal bottom portion with holes leading into the channel. While the patent describes only the single hole 22, there is a hole at the junction of the bottom with the side wall which he numbers 21 in Figure 1, and which in Figure 4 he numbers, respectively, 41 and 39.

As Defendant's Exhibit D, we offer in evidence the Dyer patent No. 2,313,928, and we are relying on Figures 1 and 2, the patent having several sheets of drawings, and then in the specification the passages which are found respectively on page 1, column 1, lines 1 to 4, lines 20 to 25, lines 32 to 35; in column 2 on that page, lines 39 to 44.

410

On page 3, column 2, the entire column except the last four lines.

And on page 6, column 1, lines 37 to 44.

I call attention particularly to page 3, column 2, where the applicant describes the trap or basin in the bottom of the wash tub as having a series of holes around the side 182, which he says are rather large, three-eighths of an inch, which is more than a quarter of an inch, and large compared with the holes 198 in the side wall of the tub. He says in describing it, on page 3, column 2, where he describes the spinning operation, that—

> "The water is drawn through the outlets 182 and 186 and up the risers 190 by centrifugal force since the risers 190 are tapered outwardly and have a spout which overhangs the collecting trough 34."

Shown in the other figure.

He says:

> "These passages form a centrifugal pump which
411 rapidly expels the water from the tub into the trough from which it flows down through the pipe 36 to the drain."

He says:

> "This method of removing water also provides an excellent means for removing the sand and dirt which does not remain in suspension in the water but which collects in the bottom of the tub adjacent the holes 182. The rapid movement of the water from the tub out through the holes 182 carries the sand and dirt with it and so cleans the bottom of the tub. Instead of the four risers 190, the metal may continue around the tub 104 to form a single tub shaped riser."

I want to show in this connection this patent does show a tub that tapers inwardly, where Dunham shows both this type and one that tapers outwardly; and this patent does differ from the patent in suit; instead of spinning water over the tub, they empty it by spinning it through the sediment trap and up these flumes on out.

412 As Defendant's Exhibit E, we offer in evidence the Smith patent, No. 2,637,188, which is cited alone against the Roth patent, advanced against the Castner patent; and in that connection we point out the following passage that bears on the issue here.

We rely on both sheets in the drawings and column 1 of the patent, the entire column except the first three lines and the last line.

Column 5 of the patent, line 37 to line 34 in column 6, and also in column 6 the last three lines; and the first paragraph in column 7.

I call attention to the structure briefly, without reading to you, as the patentee points out that he can either make this structure as part of a double wall tub or make these vanes separate. He points out that the sediment accumulates down in this green zone at the bottom, and then when the tub is spun, and here, unfortunately, while the description in the patent is absolutely accurate, the arrows are drawn in the wrong direction. While the machine is spun the direction of these vanes between the two walls of the tub is such that the water and the dirt are lifted up and spun out over the edge of the tub. And we say that is an anticipation of the Roth patent.

413 As Defendant's Exhibit F, we offer the colored chart which was submitted with the trial brief; and I may point there is nothing added to those charts and the claims contained therein other than color. It is a hard bound book, your Honor, of this type, with little tabs at the top, and it is merely a demonstration of the defendant's position of what the sediment trap is in these devices, and how the claims read on the prior art. I would like at a convenient recess to mark the copy which the Court has Defendant's Exhibit F.

Mr. Carlsen: May I ask one question?

Mr. Ooms: Yes.

Mr. Carlsen: I understand the only patents you are offering in evidence are the five in the yellow book, Defendant's Exhibits A to E, inclusive.

Mr. Ooms: That is correct.

Mr. Carlsen: None of the patents in Defendant's Exhibit F other than those are being relied upon?

Mr. Ooms: I don't rely on any others, Mr. Carlsen, the charts in Exhibit F are taken from either the five patents or the two patents in suit. Of course, the Castner patent is by the statement of the Roth patent prior, that is,
414 against the Roth patent. That I think I made clear at the beginning of the case.

Mr. Carlsen: All right.

415 ANDREW H. GERHARDT, called as a witness on the part of the defendant, being first duly sworn, testified as follows:

The Court: What is your name?

The Witness: Andrew H. Gerhardt.

The Court: Where do you live?

The Witness: Herrin, Illinois.

The Court: What do you do?

The Witness: I am chief engineer at the Washing Machine Division of the Norge Division of the Borg-Warner Corporation.

The Court: Proceed.

Direct Examination by Mr. Ooms.

Q. How old are you, Mr. Gerhardt?

A. 57.

Q. Where did you receive your schooling?

A. My schooling was limited to high school and Lewis Institute courses.

Q. And Lewis Institute was a school that was in the City of Chicago and later merged with what is now the Illinois Institute of Technology?

A. Correct.

416 Q. When did you enter the washing machine business?

A. In around 1916 or 1917.

Q. And how long did you remain in it?

A. Continuously until now, with the exception of one year or thereabouts intermittently.

Q. What were your first positions in the washing machine business?

A. The first position was a draftsman at the company called Mokan Eden Manufacturing Company, at Alton, Illinois, working on washing machines.

Q. When was that?

A. 1916 or 1917.

Q. Where did you go from there?

A. From there I went to Chicago, Illinois, and I accepted for a short time another occupation, and I then went with the Alsbaugh Dover Company in Chicago, who were introducing at that time or intended to a washing machine, and I assisted in the development of that washing machine.

Q. When did you leave there and where did you go?

A. I left there in 1922 and went with the then Hurley Machine Company, since changed to Electric Household Utilities Corporation, and later, Thor Corporation.

417 Q. How long were you with the Hurley Machine Company and its predecessor companies?

A. Twenty-seven years.

Q. What position did you rise to there?

A. For the last ten years I was chief engineer.

Q. Where did you go from the Thor Company?

A. To my present position in the Norge Division at Herrin, Illinois.

Q. Mr. Gerhardt, there has been introduced in evidence here as Plaintiff's Exhibit 19 a cut-away tub of the Norge machine which we have been calling the second accused device. Are you familiar with that structure?

A. I am.

Q. Did you have any part in the design of that, of the sediment trap in that unit?

A. I did.

Q. Tell us what part you had and how it came about, and when it was.

A. The thought along that direction originated about the time following a notification by Mr. Castner that he had a patent either issued or in development that would conflict he thought with our then construction. We gave at
418 that time between ourselves, management and Patent Department, consideration as to whether we agreed with that, and what, if anything, could be done to make it slightly different than it was before. As a result of that we experimentally made the No. 2 design.

Q. When was that, Mr. Gerhardt?

A. The design was conceived in May, 1952 the No. 2 tub.

Q. Who conceived of it?

A. I did.

Q. Do you have any drawings there which show the type of tub as you then conceived it?

A. I do.

Q. What is that drawing?

A. It is numbered SK-8654, entitled "Proposed Basket Sump Construction."

Q. I note that you have put on the signature and some other writing. Who put that on there?

A. I put the signature on.

Q. When was that put on?

A. On May 12, 1952.

Mr. Ooms: I would like to have the drawing referred to by the witness marked Defendant's Exhibit G.

419 (Documents so marked.)

By Mr. Ooms:

Q. I note that the signature is dated May 12, 1952. Did you say when it was applied?

A. No, I did not.

Q. When was it applied?

A. We then changed tooling and made provisions for incorporating that in the machine, and it went into production in November, 1952, and is still in that same form.

Q. How did the production model that you first began to make in November, 1952 compare with this specimen we have before us, Plaintiff's Exhibit 19?

A. That is identical.

The Court: Let me see now; what physical exhibit is that?

Mr. Ooms: Plaintiff's Exhibit 19, the second accused machine, second Norge machine.

By Mr. Ooms:

Q. At the time you designed the second Norge machine, was there any machine on the market that incorporated what we have been calling here the Roth type of tube, with the trailing discharge tube?

A. Yes, I believe there was.

420 Q. Whose was that?

A. As I recall—I am not certain—I think it was called a Coronada, the one that I was familiar with.

Q. In 1952. Do you recognize the Coronada tub?

A. In 1952?

Q. Yes.

A. Is that the date upon which you asked my recollection, or whether there was another machine? Repeat the question, please.

Q. I was not asking merely about the sediment discharge trap and tube; I was asking about a specific form of tube such as the spiral tube which we have been calling the Roth tube here—when did you first see that?

A. On an Easy washer.

Q. About when, do you recall, with relation to your production of the second Norge design?

A. Well, about the same period I would say. I don't have a recollection of an exact time that I saw that.

Q. Was it before you designed your second form?

A. Yes.

Q. You think you saw this spiral tube before that time?

421 A. I think so. My recollection of that is indefinite. I don't recall exactly when I saw the spiral tube. I am not sure of that.

Q. Had you seen any drawings of this so-called Coronada machine, as you call it, with the spiral tube prior to that time?

A. Yes, I had.

Q. Prior to your production of the second type?

A. No. I am afraid I will have to retract that statement.

Q. Just tell us your best recollection of the fact, Mr. Gerhardt.

A. The spiral tube was not a part of my endeavors, or paying any particular attention to spiral outlets.

Q. What were you trying to do when you designed this

tub, Plaintiff's Exhibit 19, the second accused device here?

A. The endeavor was to change the construction, to get the same results with a different construction, and the construction differs basically in two respects.

Q. What are those respects?

A. No. 1 tub, the sump was eccentric; in No. 2 the sump groove is concentric. In the second respect the outlet from the sump to the tube was radial; in the sec-
422 ond tub it is tangential.

Q. You are now referring to the fact that in Plaintiff's Exhibit 18 the tube comes out directly radially from the center, whereas in Exhibit 19 the tube comes out at a tangent to the circle, is that correct?

A. Yes.

Q. What does the eccentricity have to do with it?

A. We thought in the first tub that it was a necessity, that it was desirable, beneficial theoretically to have an eccentric, and have the outlet at the farthermost point. Experiments at that time, at the time No. 2 was conceived and since then other experiments proved to us that it was not necessary and that we got equal results whether they were concentric or not.

The Court: What do you mean by not concentric at that point?

The Witness: I mean that the outer wall of the sump, annular groove which makes the sump, the outer wall of that was not centrally located with respect to the center of the basket.

By Mr. Ooms:

Q. And what is the fact with respect to Plaintiff's Exhibit 19? Is it eccentric or concentric? Plaintiff's
423 Exhibit 19 being the second Norge design.

A. That is concentric.

Q. And why did you attempt to avoid the eccentricity which had been built into the first design?

A. We advised, as I said before, our management and Legal Patent Department, of this statement by Castner. Due to the fact that Beam Company was a substantial customer of Borg-Warner Corporation, it was deemed desirable by our management to maintain a very friendly relationship with that company; and my own management requested me to make this suggested change which evolved in the No. 2 design.

Q. What determined the shape of this tube which you have in your No. 2 design which travels horizontally a short distance and then goes vertically upward?

A. Again, it is the fact that we tried to get differences between the first design, and that is one of the two differences, substantial differences. There was no reason to make it tangential other than to make it different than the first design.

Q. And what determines the length of this horizontal run of tube in Plaintiff's Exhibit 19, the second Norge machine?

A. Generally to fit the physical dimensions of
424 what the groove is at a certain diameter outside of the tub at the top and at another diameter. It merely takes that length to get from one place to the other.

Q. Mr. Gerhardt, have you ever had occasion to make any tests to determine the speed and efficiency with which these two Norge types of tubs, Plaintiff's Exhibits 18 and 19 respectively, discharge sediment from the sediment trap?

A. We did on various occasions, starting with—well, starting with the original sump, and next with the No. 2 design when that was in development; and since then other designs. Our method of evaluating the benefits of any sump design were to proceed as follows:

We filled the tub partly, partially filled with water, and in that water we added a measured amount of heavy material, such as sand or equivalent, in this case black, so you could see it better. We then put the machine within a given design through a complete cycle, which removed the first washing in order to get the sediment to fall through the holes in the sump during extraction. Then our method of determining the value was to then, having run a complete cycle, remove the tub from the sump, which is a
425 separate part, and examine the sump for residual sediment left in there after its operation.

We, knowing that, we in our tests, knowing that of a given amount of silt, which is probably in excess of the normal, still remained in there after one cycle. Succeeding cycles would continue to remove more than that. But we evaluated it on the one cycle, and by duplicating that with different designs we were able to virtually see the difference in the deposit left in that groove and also to measure it.

Q. What did you observe as to the amount of silt left respectively in the sediment traps of a tub like Plaintiff's Exhibit 18 in the first Norge design compared with Plaintiff's Exhibit 19, your second Norge design at tests as you have just described you have been testing?

A. We found no difference in the result.

Q. Mr. Gerhardt, in your work as chief engineer, both with Hurley and with Borg-Warner Corporation, have you ever had any experience in determining costs?

A. That is part of my job.

The Court: "Costs," did you say?

426 Mr. Ooms: "Costs."

We have here a tub which I shall ask counsel for plaintiff, which we procured through him, is the third form of Beam tub and the only one that has been made by the Beam Company since November, 1954.

Mr. Carlsen: I have never seen this tub before, but if it was sent to you, and you say so, Mr. Ooms, I won't question it.

Mr. Ooms: We have stipulated in November, 1954, you began and since have continued the use of this particular tube in the tub.

Mr. Carlsen: The one you are holding in your hand now, is that marked as an exhibit?

Mr. Ooms: No, but I will get to it. I will ask the reporter to mark merely the tube and the other accessories which came with the tube in this envelope consisting of a washer and four screws, as Defendant's Exhibits H and H-A, respectively.

(Articles so marked.)

By Mr. Ooms:

Q. Have you had an opportunity to examine this tub with the white balancing weights and the parts of
427 the sediment discharge tube which came with that, consisting of an aluminum tube, a mounting flange, and a grommet, on Defendant's Exhibit H-A, and a washer and four screws, two of them self-tapping, in the envelope marked Defendant's Exhibit H?

A. I have examined them. That includes the complete tub assembly, and this is part of it you have in your hand.

Q. Oh, without the tub.

A. These parts are one example of a tube which leads from that sediment trap to the top of the tub on the outside of the spin tub.

Q. And from your experience in determining costs, what would the cost be for these parts and their installation on a tub like that here in evidence?

A. The parts that you have in your hand is this part of the exhibit not associated with the rest of it. I have esti-

mated that can be purchased complete in all respects for a cost of between thirty and thirty-five cents each.

Q. And what would the cost of installation be per tub?

A. Within pennies, two cents or thereabouts—not to exceed that.

428 Q. Your total estimate then of the parts necessary to make this discharge tube from the tub, and the cost of putting it on, would be something less than forty cents, as I understand it?

A. Yes, definitely.

Mr. Ooms: I would like to offer in evidence the drawing identified by the witness as Defendant's Exhibit G, and the parts to which he has referred in making this cost estimate as Defendant's Exhibits H and H-A.

Mr. Carlsen: May I see them, please?

Mr. Ooms: Yes.

Mr. Carlsen: I have no objection to what the drawing shows.

(Defendant's Exhibits G, H and H-A were received in evidence.)

Mr. Ooms: That is all with this witness.

Cross Examination by Mr. Carlsen.

Q. Mr. Gerhardt, I believe you are acquainted with Mr. Castner, are you not?

A. I am.

Q. You have known him for a good many years?

429 A. I have.

Q. Worked with him in the washing machine industry?

A. I worked with him indirectly, just as an industry only.

Q. You have had a good many contacts with him, have you not?

A. I have.

Q. Your company has sold him tubs, is that right? You sold him tubs from time to time?

A. The parent organization has.

Q. How many years have you known Mr. Castner?

A. Why, I don't know, exactly; at least fifteen.

Q. During all that time what kind of a man has he been in your experience; what is his reputation in the industry?

A. Very good. I admire Mr. Castner.

Q. Now, Mr. Castner, who has actually made, or his company has actually made, the tub with and without the tube that you have been speaking about, he estimated, having his knowledge from his own factory, that the difference in the cost might be, I think he said seventy or seventy-five cents. Now, don't you think that his experience in the actual production of the machine with and without the
430 particular tube is one, particularly under this set of circumstances, that might be different than yours?

A. I would say no to that. His estimate and mine would probably coincide very closely if we were talking about the identical same parts. His estimate may be including other components which I am not including. I included only those parts in the question.

Q. But even without reading it or hearing it, you would not question the sincerity or integrity or correctness of Mr. Castner's testimony, would you?

A. I would say he was mistaken as to the cost, if his estimate referred to the parts in question, because that is a matter of some record and is not subject to any particular company, because those are purchased parts, can be purchased in the market for those costs.

Q. Was it a matter of record with your company? You never made them without tubes, did you? You never made washing machines that had sediment traps and no tubes?

A. No, we did not.

Q. So you have no absolute record; it is a pure
431 guess on your part?

A. No. It is a definite cost; those parts are purchased, and it is very definite as to what they cost.

Q. What condition do you buy tubes of this kind in, in what form?

A. Finished, completely fabricated.

Q. And you have purchased tubes that are the exact shape of the tube that you have had in your hand a moment ago?

A. Not the exact shape, but we have had variations of shape. We have purchased shapes that are of the first style and the second style, so we know that the cost of those purchased is very similar. The shape affects it very little; the amount of material and length of the tube is the governing factor principally.

Q. Now, the Beam Company may have purchased tubes, may they not, in a raw condition?

A. They may have.

Q. And then they would form the two grooves in them themselves; they may have done that?

A. They may have.

Q. May that have been an element Mr. Castner included in his cost estimate, or might it not?

432 A. Very possible that it was manufactured in that fashion, and if it was and cost that much, it must have been a very crude method of forming and making the tube.

Q. Well, I did not ask you that. I said he may have bought the tubing, his company may have bought the tub-

ing, and formed it into the shape they wanted it themselves?

A. They may have.

Q. That would take in some labor and equipment, would it not?

A. Yes.

Q. They also had to put a flange on one end to fasten it to the sump, as you call it?

A. Yes.

Q. That requires labor and machinery?

A. Yes.

Q. They had to get a little oval place?

A. Yes.

Q. That cost money?

A. Yes.

Q. And labor to make it?

A. Yes.

Q. They also had to have these screws to fasten
433 that in the sump?

A. Yes.

Q. They had to have the holes for that in the sump, for those two screws?

A. Possibly.

Q. Well, at least they had to put two holes in there for the screws?

A. Correct.

Q. Do you think they could do all that labor for an estimate of two cents?

A. No. The two cents was to assemble these parts after manufacture to the machine.

Q. I understood it was labor cost over and above what material costs were. Then you have not in your thirty-five or forty cent estimate included labor costs, but only the purchase cost of the parts and their installation?

A. My original estimate of the cost of those parts here, without assembly, was thirty to thirty-five cents. The estimate of forty cents would include any assembly labor to the tub.

Q. Now, you testified that when you made the second Norge design here in evidence as Plaintiff's Exhibit 19, you made some changes over and above the first de-
434 sign here in evidence as Plaintiff's Exhibit 18, both of which are in front of you. Is that correct?

A. Yes, that is correct.

Q. And in the second design you got away from the eccentric type of channel or trap, and put in a concentric type?

A. Yes.

Q. That was one change. The other change was that you put the tube at a tangent instead of disposing it in a pure radial direction as you did in the first tub?

A. Correct.

Q. I think I quote you correctly when you said, "There was no reason to make the tube tangential except to make it different." Just what do you mean when you say that, just a different appearance?

A. Different construction.

Q. Well, you say just to make it different. Why do you have to make it different? What reason was there for making it different?

A. The reason for that originated with Mr. Castner's notification to us that he thought that our construction infringed his patent or patent application.

Q. Did you then, by changing the construction, the tangential tube, expect that that was going to be
435 the answer, that by doing so you were going to avoid infringement?

A. It was beyond my decision. The decision in that case and the thought behind it were in our central management and in our Legal Patent Department.

Q. Well, in other words, you don't claim to be familiar with the patent problems at all, or patent claims?

A. I am familiar with them, certainly.

Q. You are familiar with them?

A. I am.

Q. Do you find any claims that are here in suit of the Castner patent that make a difference—

Mr. Ooms: Object. I have not examined him about any patent claims, and don't propose to. He is not put on as a patent expert, but only to tell the history of the development of the machine.

Mr. Carlsen: He said he had a reason for making these changes.

The Court: You are familiar with the claims?

The Witness: Yes.

The Court: He may answer.

436 By Mr. Carlsen:

Q. What claims did you think you avoided by making the change from a purely radial and vertical tube to the tangential tube beyond you just used more material?

A. I don't agree necessarily that more material was used, which is part of your question.

Q. We will omit the fact of more material. At least, you changed the construction from the radial type of tube to the tangential type. What claims did you figure you avoided by doing that?

A. Primarily, the object was to—I believe it is claim 1, which was the eccentric sump.

Q. I will go along with you, Mr. Gerhardt. Claim 1

has the eccentric sump. Now, the other claims in suit say nothing about the eccentric sump, do they?

A. I can't answer that.

Q. You don't remember that?

A. No.

Mr. Ooms: Object. May my objection stand to all of it, so I need not repeat?

The Court: Yes.

By Mr. Carlsen:

Q. Now, you stated that you have made some
437 tests, and you find out that the two types of design have about the same result in so far as removal of sediment is concerned?

A. That is correct.

Q. Have you made any other tests than those which you stated merely by accounting for the amount of sediment that was left after each experiment?

A. We attempted other means of evaluation, and determined that that was the most accurate one that we could conceive of.

Q. But, if you put sand in the trap or in the clothes, a certain amount, so that it reached the trap and you after each cycle of spinning got all the sand out through both types of machines, would that still establish that one was any better than the other, one of them any better than the other?

A. If it was under the same conditions, all the sand out under either construction, I would assume that they were equally beneficial in the operation of the sump.

Q. But did they get all the sand out every time?

A. Only in one operation, in one complete cycle, neither construction removed all of this sediment that we injected.

438 Q. Now, assuming, if we may, that the tangential or spiral type of tube has something bigger in it, like, we will say, bobby pins, or some heavy gravel, have you made any test to determine whether the initial velocity would be any greater in that type of tube than in the other tube?

A. When you speak of gravel, and bobby pins, and so forth, in our construction those things cannot enter, and therefore it is not testable to find out.

Q. You can get a fair amount of gravel or heavy sand in there?

A. Heavy sand, yes.

Q. Have you made any effort to determine whether the initial velocity is any greater in the tangential type of tube than in the radial type tube?

A. No, I never conducted such an experiment.

Mr. Carlsen: I have no further cross examination.

Re-Direct Examination by Mr. Ooms.

Q. In the envelope, Defendant's Exhibit H, the two mounting screws for the tube flange are self-tapping screws. Was your cost based on the use of those or on the use of a separate tapping operation?

439 A. Mr. Carlsen said the holes would have to be tapped, and that was my comment, that in the case of the self-tapping they would not have to be tapped.

Mr. Ooms: That is all.

(Witness excused.)

The Court: Pardon me just one moment.

Mr. Ooms: We are going to set up some apparatus. If we notify the Clerk or the Marshal when we are ready, would that be agreeable?

The Court: That will be all right.

440 WILLIAM COLBURN, called as a witness on the part of the defendant, being first duly sworn, testified as follows:

The Court: What is your name?

The Witness: William Colburn.

The Court: Where do you live?

The Witness: 9152 South Clyde, Chicago.

The Court: What business or profession are you in?

The Witness: I am a consulting chemist and chemical engineer.

The Court: For whom?

The Witness: Colburn Laboratory.

The Court: That is your own?

The Witness: Yes.

The Court: All right.

Direct Examination by Mr. Ooms.

Q. Mr. Colburn, what has been your academic training?

A. I have a bachelor of science degree in chemistry from the University of Chicago in 1935; and a doctor of philosophy degree in chemistry from the same school in 1938.

Q. Have you had any other academic training or
441 academic experience in the teaching of your science?

A. I was a laboratory instructor in chemistry at the University of Chicago from 1936 through 1938. I did doctorial research there for six months after 1938. I was an instructor in chemistry and physical science in the Chicago City Junior College from 1939 through 1943. I was lecturer in physical sciences at Roosevelt University, 1946 through 1951.

Q. Have you received any academic distinction for your studies?

A. Yes. I was elected to the Phi Beta Kappa in 1935, and Sigma Psi in 1938.

Q. What is Sigma Psi, Doctor?

A. Sigma Psi is an honorary society to which one is elected on evidence of ability to do original research.

Q. And what experience have you had in connection with writing on scientific subjects?

A. The main experience is a textbook on physical science, on which I was co-author. I have one or two published articles also.

Q. What is the title of your textbook?

A. Physical Science Made Easy.

442 Q. Who was co-author with you?

A. Dr. Theodore Phillips.

Q. Are you a registered professional engineer in the State of Illinois?

A. Yes, I am.

Q. What work have you done in the engineering field?

A. I have done design work in chemical manufacturing equipment, especially as regards piping, valves, pumps, and flow of fluids, and testing of equipment that is used in the dry cleaning and home laundry industry.

Q. Who did you first work for when you completed your teaching work, I believe at the Chicago Junior College, in 1943, Mr. Colburn?

A. I became chief chemist for the Ninol Laboratories, who are manufacturers of detergents.

Q. Am I correct in saying that detergents are cleaning compounds used in laundries and other work?

A. Yes.

Q. Have you had any laboratory experience other than

that of directof of research for Ninol Laboratories from 1943 to 1953?

443 A. I worked about half time at Davitt Laboratories from 1939 to 1945. They were consulting chemists and chemical engineers.

Q. And when did you join Colburn Laboratories?

A. In August, 1945.

Q. And you have been in that work ever since?

A. That is right.

Q. You said you had done some testing and designing and development work in what fields, Doctor?

A. Mainly in detergents and related materials, like emulsifying agents, and in the application of these materials.

Q. Have you done any work in that field of the design, use and testing of wash machines?

A. Yes. I tested various proposed designs that were in the process of development by one of the large manufacturers of washing machines: and last year I tested a number of commercial washing machines for the Norge Company for their cleaning efficiency.

* * * * *

445 Q. When you mention another large manufacturer, that is not a party to this case, is it?

A. A licensee of the plaintiff.

Q. Have you had any other work in the washing machine field than the testing of the machines of these two manufacturers you have referred to?

A. I have done testing and designing of the washing machines used in the dry cleaning industry, which are in many cases similar.

Q. Doctor, I looked at my notes, I don't know whether I cut you off. Did you mention that you had been lecturer in the Roosevelt University for five years?

A. I believe I did.

Q. In what field?

A. In the physical sciences.

Q. Doctor, we have set up here on the rostrum before the Court some apparatus. Will you describe to us what we have here?

A. This is an apparatus which I had built to demonstrate the principles of centrifugal action as applied to the spinning cycle of the washing machine. It is a miniature model, made of clear plastic so that the flows of
446 the fluid and sediment are observable. This machine does not attempt to duplicate exactly the forms and dimensions of the commercial machine. In fact, being miniature in size, it cannot duplicate the multitude of parts, reproducing which depends upon the size of the machine. It does, however reproduce the principles of operation in the spinning and centrifuging steps of the machine.

Q. Will you describe to us the basic structure which is on the rostrum before the Court?

A. This structure consists of a stand which supports a stationary tub. This tub has a drain and collects the water that is spilled from the rotating tubs that correspond to the designs of the various rotating imperforate washing machine tubs.

Below this stationary tub is a motor with a gear drive for rotating the driven tub. There is also a variac speed control to control speed of rotation and tachometer to show the number of revolutions per minute of the rotating tub.

Q. What ranges of speed are available to you in this demonstration apparatus?

A. Up to about 1100 revolutions per minute.

447 Q. Do you know at what speed the spinning cycles in the domestic washing machines operate?

A. I understand it is about 600 revolutions per minute.

Q. And what has your own experience been in the tests you have made of washing machines?

A. I never timed them, but looking at them I would estimate that they are about in that range.

Q. Now, Doctor, the machine before us which you have described does not have in it at this time anything comparable to the wash machine tub which is spun by the motor. Can you (with the Court's permission, if the witness may step down from the stand) show us one of the tubs you have for that purpose, and describe to us what it is, and how it is operated?

A. The first tub I would like to demonstrate is the usual cylindrical tub. The walls are straight, not tapered. I am placing it on the driving shaft, and I fasten it down with a plastic member that is shaped something like the impeller of a washing machine. This impeller, however, will not be used to oscillate the water as in a washing cycle.

448 The purpose of having vanes on this impeller is to cause the water in the tub to rotate as the tub rotates; otherwise the water would tend to slip on a smooth wall. In an actual machine the impeller may rotate the tub, or help drive the water out. In the case of a free wheeling impeller, the clothes produce enough friction to cause the water to rotate substantially at the same rate as the tub itself does.

Q. Doctor, before you put any water in there, could you demonstrate for us how your machine drives this tub, so that we may before any water is put in show the Court what the machine is capable of?

A. I cause the machine to move by setting the dial on this variac speed controller; and as you will see, it rotates at a speed which I can control by rotating this knob. I now

have it turning at approximately 100 revolutions per minute, now about 400, and so on up to top speed of about 1,000.

Q. What was your first demonstration with this, Doctor?

A. You mean with liquids?

Q. Yes.

449 Mr. Ooms: It is approaching twelve o'clock, your Honor. Does your Honor want us to begin with the water now, or wait until after lunch?

The Court: We will wait until after lunch. Two o'clock.

(Whereupon a recess was taken to 2:00 o'clock p.m. of this day, April 26, 1956.)

* * * * *

451 WILLIAM COLBURN, a witness on the part of the defendant, having been heretofore duly sworn herein, resumed the stand and testified further as follows:

The Court: You may proceed.

Mr. Ooms: If your Honor please, in general we have marked the demonstration machine as Defendant's Exhibit I, and the first of the tubs as Defendant's Exhibit J. I have arranged with the reporter that we will not delay anything by marking them now, but will mark them in recess, if agreeable to your Honor.

The Court: That will be all right.

By Mr. Ooms:

Q. Dr. Colburn, when we adjourned for lunch you had assembled in the machine the first of the plastic tubs, which you described as a straight wall cylinder, which is marked as Defendant's Exhibit J. Will you proceed with the demonstration of how that operates, and tell us what principles are involved in its operation?

A. To do this, I have some water which I have colored with a blue dye, ordinarily not colored; it is ordinary water.

Q. What is the purpose of the coloring?

A. The coloring is to make the water more visible.

Q. How much of that water do you put into the tub, Defendant's Exhibit J?

A. I am going to fill this tub about half full of water. I will now start this tub rotating at a relatively low speed, and it is observed that the water climbs up the wall of the tub and a depression forms in the middle. This depression has a curved surface somewhat like the end of a football or end of an egg.

As the speed is increased, the water climbs higher and higher up the wall, and finally at a high enough speed it begins to throw over the edge, and with still higher speed it throws out more rapidly.

Q. Doctor, what force is it that drives the water up the
452 wall of that vertically walled tub, Defendant's Exhibit J?

A. The centrifugal force acting on the water tends to make it flow outward, and as it is restrained by the wall and the bottom of the tub under it, it has no course except to climb up the balance of the water in the tub, and climb up over the wall. The amount of force is determined by the speed at which the tub rotates and also by the diameter of the tub. I think the effect of the speed was visible in this demonstration.

Q. Now, the demonstration you have just made in emptying the tub over its side wall corresponds to what operation in the operation of the domestic washing machine we have been discussing here the last few days?

A. Well, this will correspond to the extraction cycle, the cycle in which the water is ejected from the tub and the clothes after the washing or after rinsing.

Q. This principle of the centrifugal force for driving liquids upward and outward, is that a new or recent scientific principle? What can you tell us of it?

A. The existence of centrifugal force has been
453 known apparently for thousands of years. The mathematical formula of the force involved has been known at least since the time of Newton. I don't know when it was originated, but I know Newton used it in demonstrating the law of gravity.

Q. And that is over two hundred years ago?

A. Yes, almost three hundred years.

Q. Doctor, as you disassemble that and invert the cylinder so it may empty itself completely, I would like to ask you about some photographs that we have.

Mr. Ooms: I would like to hand the Court these three, which will be marked Photographs 1, 2 and 3 of Defendant's Exhibit K. May the bailiff hand them to your Honor?

The Court: Yes.

By Mr. Ooms:

Q. Doctor, will you look at these three photographs, marked 1, 2 and 3, of Defendant's Exhibit K, and tell us briefly and successively what they show as compared with the demonstration that you have been undertaking here?

A. Photograph number 1 is a general view of this
454 machine, and shows the structure, the outer tub, and the inner tub in place, and to the right a portion of the tachometer.

Photograph No. 2 shows the cylindrical tub that I have just demonstrated.

Photograph No. 3 shows the cylindrical tub rotating at a speed insufficient to cause water to flow over the top, but it shows the form that the water surface takes under the influence of rotation.

Q. You have photograph No. 4, Doctor.

A. Photograph No. 4 shows the situation when the tub has reached the speed at which it begins to throw water over its top edge. This is a high speed photograph taken, at an exposure of a little less than 1/1000 of a second; and the water droplets flying off the rim of the tub and flying through the air are visible in this picture.

Photograph No. 3 was also taken at high speed.

Q. Does the tachometer in the photograph No. 3 show the speed at which the cylinder was being rotated at the time the picture was taken?

A. Yes. It shows a speed of about 360 or 370
455 revolutions per minute.

Q. I now call your attention to another cylinder which you have produced with your equipment, which is marked Defendant's Exhibit L. Will you describe that for us, Doctor?

A. This cylinder has a diameter at the bottom the same as the first cylindrical cylinder; but the walls are tapered upwardly and outwardly. Unfortunately, a bit of the top edge apparently was broken while it was moved over here.

Q. Will that affect the essential demonstration of the principle involved, Doctor?

A. No, it won't affect the essential principle, but it will cause the water to come out a fraction, a little bit speedier than if it had to go all the way to the top; but the point we are illustrating by the taper won't be affected here.

I am now filling this tub about half full. I am starting to rotate it at a low speed; and again the formation of the curved, downwardly curving surface of the water can be seen.

In this case the water can climb up the wall more easily,

because it has an inclined plane to climb up. It re-
456 quires a bit less force to climb up this tilted surface here. As the water gets up higher and higher it finds itself rotating at a greater and greater diameter so that this centrifugal force increases as the water climbs up. Therefore it becomes easier to eject water from a tub rotating—

The Court: Is that the reason, the different type of wall in the tub?

The Witness: I made this tub tapered to illustrate the principle that the water will come out at a lower speed because of the taper. I think it is apparent that this water starts to come out of the tub at a lower speed than in the first case. As I increase the speed this tub will be emptied.

By Mr. Ooms:

Q. Doctor, with the tapered tub, Defendant's Exhibit L, you stated that the water climbed up more readily, and was ejected over the upper rim at a higher speed. What were the reasons why at the same speed you could raise the water to a higher level?

A. Well, the water climbed out of the tub more quickly at a lower speed of revolution. The reason for that is
457 that the water is climbing up a slope, and under the effect of a horizontal force directed against the wall, the water can climb up the slope more easily than it could up a wall that was perpendicular to the force. The other reason is, as the water gets higher in the tub it finds itself rotating at an area of larger diameter, so the effect of the centrifugal force is greater.

Q. I show you two photographs, Dr. [illegible] have been numbered 5 and 6 of Defendant's Exhibit K, and ask you if you will tell the Court what those two photographs illustrate?

A. Photograph No. 5 is a photograph of the tapered

tub that I have just demonstrated. Photograph No. 6 is a photograph of the same tub being rotated at a speed just sufficient to cause water to climb over the top edge.

Q. Does a tachometer indicate at what speed the tub was turning, the tub Defendant's Exhibit L, at the time the water began to climb over the top edge of the tub?

A. Yes. In this case the tachometer shows a speed of approximately 270 or 280 revolutions per minute.

Q. Now, Doctor, will you produce your next tub,
458 and tell us what it is structurally? Let us mark that as Defendant's Exhibit M at the bottom.

A. This tub is one with a straight cylindrical wall but with an extra layer of plastic at the bottom to form a recess space, which I think you are referring to as a sediment trap. This recessed space in this tub is oval in shape, and at the ends of the longer axis of the oval are tubes communicating with that space, and then rising up along the outside of the cylinder. In this tub the walls are all vertical, and these tubes coming out of the trap space are also vertical.

Q. Doctor, do you have anything here which you could use to illustrate the principle of heavier dirt or sediment and its action within a tub of this kind?

A. Yes. I brought some moderately coarse black material, carborundum.

Q. Why do you make it black, Doctor?

A. Because of its greater visibility.

Q. You are now putting water in the tub. What quantity?

A. I am filling this tub a little over half full, and I will drop a small quantity of this carborundum
459 powder into the water in this tub.

During washing there is an agitator that oscillates

back and forth for approximately ten minutes, and because of this agitation and the quiet space in the trap, this sediment finds its way into the trap. I can illustrate the principle of this by agitating the water for a minute or so, but, of course, I am not going to do it for ten or twelve minutes, so not all the sediment will get into the trap.

Q. Are you able to observe where the sediment goes within the tub as you are agitating it?

A. Yes, I am. The sediment has come over the top of the bottom plate of the agitator, and has made its way into the space below the agitator. It is hard to see this, but I believe some of it has gotten into the trap space.

I will start this tub rotating, and it can be seen at a slow speed that the water is higher in the side tubes than it is in the tub area. It is because the centrifugal force at the greater diameter of these tubes is greater than in the tub. This will cause water to be ejected from the side tubes
460 before it is ejected over the rim of the tub. In this case the angles are equal; all the surfaces are vertical. The water is being ejected from these tubes.

I will stop the machine now. Sediment can be seen in the bottom of the tubes, which shows that some of it got into this trap below by agitating the water. It is down at the corners.

Now I will run the machine. There are particles of the sediment in this beaker which collected the water from below. Would you care to see this, your Honor?

The Court: Well, I think I can see it well enough.

By Mr. Ooms:

Q. Can you proceed to empty the tub, Doctor?

A. Yes. Now, it is substantially emptied.

Q. Doctor, in the operation of this tub, Defendant's Exhibit M, on which you pointed out that there was a sepa-

rate space below the upper bottom of the tub, if I may call it that, which you call the sediment space, how do the principles by which the water in the tub part of the washing machine or the upper part of this cylinder compare with the principles that apply to the emptying of the
461 lower part or sediment trap?

A. The lower part is emptied due to centrifugal action of—the centrifugal force of rotation acts on the water in the lower part, and ejects this water through the only exits available, and these exit tubes are also rotating, and the centrifugal force on them causes the water to climb up out of these tubes. This action continues as long as there is water in the trap space available to go up these tubes.

Q. How does the principle which you have just described as being in effect to empty the sediment trap, compare with the principle of operation by which the upper part of the cylinder, Defendant's Exhibit M, is emptied?

A. The principle is exactly the same.

Q. I show you now, Doctor, three photographs, Defendant's Exhibit K, numbered 7, 8 and 9, and shall ask you to tell the Court what that series of photographs, 7, 8 and 9, shows with respect to the demonstration you have been undertaking.

A. These photographs 7, 8 and 9 are three views of the tub which I have just demonstrated. 7 and 8 are views almost head on, and photograph 9 is a view al-
462 most from the top, in which the eccentric shape of the trap shows.

Q. Will you take out your next demonstration tube, and let us mark that as Defendant's Exhibit N, Dr. Colburn, and will you describe to the Court what this structure is?

A. This tub has cylindrical walls which are vertical. It has formed in the base four pockets which are more or less

radial, and these are under the bottom of the tub. Communicating with each of these pockets are two holes, one near the central axis and one out near the corner where the wall meets the bottom of the tub. On the outer end of each of these pockets is a tube which runs up along the outside wall of the tub.

Q. Can you install that tub, Defendant's Exhibit N, in the demonstration apparatus, Defendant's Exhibit I, and show us what it will do?

A. Yes. I have now installed this tub in the apparatus, and I am filling it with water again a little over half full.

Q. Can you demonstrate that with some sediment or these particles you have been speaking of?

A. Yes. I will use the same carborundum powder,
463 drop a quantity into the tub, and then I will agitate the water, as before. I am stirring it hardly vigorously enough to whirl the powder around. I will have to do this a little longer.

Q. Are you attempting in any way in this demonstration, Doctor, to demonstrate any arithmetical values or proportions or ratios or dimensions?

A. No, I am not. All right. I have whirled this water about some in an attempt to move the powder, and I will now start the tub rotating. At this same speed the height of the water in the outer tube being above that in the inner tube is again visible. I will now run at a speed high enough to eject the water through the side tubes. I can also run it at a speed high enough to eject the water simultaneously through these side tubes and over the top.

The sediment in the side tubes is now visible. I am afraid I did not empty this collecting tub after the last one, so we can't tell whether other sediment came out, but the sediment in the side tubes here, which is plainly

visible, shows that this black powder made its way into these four pockets, so that they serve as a trap.

464 Q. I note that the sediment in the side tubes in the tub Exhibit N, to which you have referred, Doctor, is at various elevations in the tube from slightly below the top to near the bottom. What brought the sediment up to that elevated position?

A. This sediment was carried up by the water moving upward through these tubes, the water at a high enough velocity to carry the sediment up through these tubes in here or was left in the tub can be seen by the sediment I picked up on the wiping cloth, as I had wiped out this tub before the experiment.

Q. Doctor, I now hand you the three next photographs in a series, Defendant's Exhibit K, Nos. 10, 11 and 12. Will you tell the Court what those three photographs show with respect to the demonstration you have been undertaking?

A. No. 10 shows the tub that I have just used with its four pockets in the base, the holes communicating through the bottom with those pockets, and the four tubes traveling up the outside and communicating with those pockets. Photograph 11 is a top view of the same tub, and shows the pockets and holes more clearly. Photograph No. 12

465 is a high speed photograph showing this same tub in rotation at the instant when the water is just starting to come out of the side tubes. The two streams of water are visible, one on the left and one on the right, just coming over the edge of those tubes.

Q. Doctor, I now hand you a tub which I have marked Defendant's Exhibit O, and ask you to describe to the Court what the tub, Defendant's Exhibit O, is structurally.

A. This tub has an inside wall which tapers downward

ly and outwardly. That is, on the inside the diameter is greater at the bottom of this tub than at the top. The amount of this taper is small, about 1/8 of an inch from top to bottom.

There is a bottom recess in this tub, and this recess is covered by a sort of a false bottom, a circular angle which has holes drilled all around the vertical flange of this angle, and when this is put in place to form a bottom trap, the water communicates with the bottom trap through this ring of holes.

At four points issuing from this bottom space there
466 are holes drilled going to the outside of the tub. These are connected with tubes cemented to the outside of the tub. These four outer tubes are tapered outwardly and upwardly, so that water climbing up those tubes can have the benefit of the principle explained with that tapered tub.

Q. Will you install the tub, Defendant's Exhibit O, in the demonstration machine, Defendant's Exhibit I, Doctor?

A. Yes, I will do that now.

Q. Could you give a demonstration with this that involves the use of sediment?

A. Yes. I will fill this tub with clear water. I am filling this tub also a little over half full. And now, I will put a little sediment into it, the same black carborundum powder. Now I am agitating the water, as before.

Q. Doctor, while you are agitating that water, I am correct, am I not, that this is the exhibit of the tub which you have shown us in which the taper is downward and outward instead of upward and outward?

A. That is correct.

Q. What is the effect of that on the emptying or
467 rentention of water in this tub?

A. This will make it more difficult. Other things being equal for the water to climb over the top edge of the tub, a greater centrifugal force would be required in this case than in a straight vertical tub, and that, in turn, is greater than one tapering outwardly and upwardly.

Q. Is it possible to empty this tub, Defendant's Exhibit O, completely without discharging the water over the upper rim of the tub body?

A. Yes, it is.

Q. Can you proceed with the demonstration, can you proceed to demonstrate the operation of this tub?

A. All right. Again, at this low speed of rotation the water can be seen in the side tubes above that in the central part. I am now increasing the speed, and water is coming out of the side tubes. It is quite apparent that the water left inside the tub is well below the top rim.

Q. Has any water been discharged in your demonstration over the upper edge of the tub body?

A. No, none at all.

Q. When does the water stop coming from the
468 outer tube from which you have been discharging it?

A. It would stop coming out when the tub is substantially empty.

Q. Have you any observation to make with respect to the movement of the sediment in that tub, Doctor?

A. The sediment has collected for the most part in the sediment trap space between the row of holes and the outer circumference of the basin in the bottom. Some of it has been discharged through these holes. A ring of sediment can be seen in the bottom here.

Q. Will you examine that wash cloth after you have washed out the bottom of the tub after demonstrating the tub, Defendant's Exhibit O?

A. Yes.

Q. What do you find?

A. A little bit of sediment.

Q. What does that indicate, Doctor?

A. That indicates that some of the sediment has been drawn out of this tub through the side tubes and into this collecting jar.

Q. Doctor, I now show you the next series of photographs Nos. 13, 14 and 15, of Defendant's Exhibit
469 K, and will ask you to tell the Court what those three photographs show with respect to your demonstration.

A. Photograph 13 is a photograph of this tub that I have just demonstrated. In it is visible the ring of holes that communicate with the sediment trap and the four outer tubes. The upward and outward taper of the four tubes is visible in this photograph. Photograph 14 shows the inner circular angle with its row of holes removed, and shows the manner thereby in which the tub was constructed. Photograph 15 shows this tub just after it has started to discharge water from the side tubes, and the two streams of water which are at right angles to the field of view are visible in this picture.

Q. Now, Doctor, will you proceed to the next of the tubs you have prepared for this demonstration, and let us mark it Defendant's Exhibit P at the bottom. Will you describe this structure?

A. This tub has cylindrical walls. It has a circular sediment space in the bottom. Communicating with the
circular sediment space are two outlets, opposite
470 each other, and these outlets communicate with tubes which are on the outside of the tub. These two tubes rise and spiral so that they go upwardly and

rearwardly as compared to the direction of rotation; that is, the discharge end of the tube trails the inlet end of the tube as compared to the rotation direction.

Q. Will you now mount the tub, Defendant's Exhibit P, in your demonstration apparatus, Defendant's Exhibit I, and make whatever demonstration you desire, Doctor?

A. In this case I am filling this tub with water, filling it a little over half way as usual. It should be noted in all these cases that when the tub is at a standstill the water level in the side tubes is the same as in the inner tub.

Now, I will run this tub, and as usual at a low speed it can be seen that the water in the side tubes is above the level in the inner part of the tub.

At a higher speed the water begins to come out of these side tubes, and at a still higher speed will pour over the top and through the side tubes.

In this tub the diameter of the side tube is greater
471 than in the other tub I have made so the water comes out of here at a lower speed of rotation than in other cases.

Q. And what is the effect of the spiral direction in which the tubes are mounted on the outside of the tub?

A. I don't think it is possible to tell with this particular model, but from other experiments I believe it is substantially none.

Q. Are you prepared to demonstrate that, Doctor?

A. Yes, I am.

Q. And what apparatus will be required for that purpose?

A. I have another tub.

Q. I shall mark that Defendant's Exhibit Q at the bottom.

A. This other tub is made exactly like the one I have

just demonstrated which was marked P, except for one detail, and that is that the side tubes are inclined in exactly the opposite direction, as nearly as I could make them. They are exactly alike in all other respects. They have markings on the wall engraved so you can see I have filled them both to the same level in this experiment. These tubes are
472 mounted here on the same axis, so that in this movement they will be rotated at exactly the same speed or acceleration as each other.

In other words, as nearly as it is possible to do so, this pair of tubs has been constructed and will be rotated at the same speed, so they will be filled to the same level.

I have just filled the lower tub to the first mark, which is approximately half full.

Now I am mounting the second tub on the same spindle on which the first tub rides and fastening it down.

The impellers in these two cases are of identical dimensions.

I am now filling the upper tub to the same level as the lower tub is filled.

Q. How do you determine that you have reached that level, Doctor?

A. Both tubs have rings engraved on the cylindrical walls at the same levels, which I have measured before coming here.

Q. Which of the two tubs, upper or lower, is the one with the outlet in the tube trailing the inlet?

A. The lower one.

473 I mounted them upside down. The upper one is the one that has the tube trailing.

Q. Does it make any difference in mounting them upside down?

A. No, it should make no difference at all, except per-

haps the machine won't be balanced as well. We will know that in a moment when it starts running. They are a bit out of line. I think I had better reverse them. This would give a slight rocking motion to the tubs and would negate the effect that we are trying to observe. The reason for being particular about this rocking motion is that the bottoms of the tubs are machined to mesh exactly with the bottoms of the respective spindles, and when the proper tub has the proper spindle associated with it, then it rotates exactly vertically.

I am putting the trailing tub, which has marked P, on the bottom. I am again filling it to the lower of the two marks.

Then I am placing the other tub, which has its tubes turned toward the leading direction, on the other spindle above the lower tub; and I will fill that also to the same mark.

474 Now I will run this double tub machine so that it can be observed which one of these tubs begins to empty faster from the side tubes. It is observed that both start at the same time. I will do this at a different rate of acceleration. Again, with the higher rate of acceleration they both start ejecting water at the same time.

Q. Does it make any difference, Doctor, whether or not you have sediment in the tubs at the time as to their method of operation?

A. No, it does not. I believe demonstrated that the direction of the tube, leading one way or the other, does not affect the forces on the materials in the tube. If the force were to affect sediment, it would also affect water.

Q. Do you want to completely run those out, Doctor, or try that first experiment over again? We can clean that up after adjournment. Have you completed the demonstrations with which you want to use the equipment, Doctor?

A. Yes, I have.

Q. I now hand you the last of the series of photographs, Nos. 16 to 21, inclusive, of Defendant's Exhibit K. Please tell the Court what those photographs illustrate.

475 A. Photographs 16 and 17 are two views of the tub which had the circular recess in the bottom and the side tubes inclined in a trailing direction. These were used in the experiment just before this double tub experiment.

Photographs 18 and 19 show two views of this pair of tubs, which are identical except for the direction in which the tubes lean.

Photograph 20 shows the two tubes mounted on the same axis, one above the other. Photograph 21 is a high speed photograph taken just as the water starts to be ejected from these two tubs. This photograph shows a stream of water issuing from the upper tub; which in that case was the one in the trailing direction; and it also shows the stream of water issuing from the tubes in the lower tub. Both streams of water can be seen coming out of these tubes simultaneously.

The Court: We will recess for a few moments.

(Whereupon a short recess was taken.)

By Mr. Ooms:

Q. Dr. Colburn, will you return to the stand? In this last demonstration which you made with the two

476 tubs, Defendant's Exhibits P and Q, what forces were demonstrated in the operation of the discharge of the material with the spiral tubes?

A. The force produced by centrifuging was one force, as I explained in the case of the other tubs; and in the case of these inclined tubs there will be another force which would act during a period of acceleration.

Q. What force is that?

A. That is a force due to the inertia of the liquid in the tube.

Q. Have you made any computations, Doctor, as to what the effective force is in a domestic washing machine such as those we have been discussing the last few days, assuming machines of some foot and a half in diameter, which I think is about the dimensions of these, running at 600 revolutions per minute in the spinning cycle and getting to that speed in ten seconds.

A. I have made such a calculation.

Q. And what is the centrifugal force effective at the outer circumference of that tub under those conditions?

A. The centrifugal force for the driving of the
477 water in the tube is 92 pounds.

Q. And what is this other force you mention that was effective in the spirally mounted tubes which trailed as to the outlet with respect to the inlet of the tube?

A. The force due to the inertia effect in the trailing tube at the same speed and dimensions is 1/10 of a pound per pound of water.

Q. In other words, the ratio, is about 920 to 1?

A. That is correct.

Q. Now, Doctor, I asked you to examine these tubs and to make a computation with respect to the rate of drainage from the bottom, and in that respect I would ask you to compare Plaintiff's Exhibit 14, which is the first of the Beam structures, with Plaintiff's Exhibit 18, which is the first Norge accused device, the dimensions I have selected are that the Beam device has a diameter at the lip of the annular trap of 9 inches, and the annular trap has a width of 1/2 inch; whereas, the Norge machine has a total of 40 holes of 7/32 of an inch in diameter. Have you made that computation?

A. Yes, I have.

478 Q. What is the relative speed at which the two would drain water on the surface of the bottom of the tub?

A. The speed with which water would drain, other things being equal, is proportional to the area of the openings through which the water can drain; in one case, the case of the annular opening, the area is approximately ten times the area of the total 40 holes.

Q. Now, I note that I have erred, Dr. Colburn, in that the effective widths of the Beam annulus is probably a little more than half an inch. In what direction would that affect the computation?

A. That would permit water to drain at a greater rate in the case of the larger space of the annulus.

Mr. Ooms: I would like to offer in evidence at this time the exhibits which were used by Dr. Colburn in his demonstration, which are Defendant's Exhibits I to Q, inclusive, being the machine with which the demonstrations were made, and the several tubs used in the demonstrations, together with Exhibit K, which is the series of 21

479 photographs, as Defendant's Exhibits under those respective designations.

Mr. Carlsen: I object to all of those exhibits as establishing nothing of any consequence in this case. They have not connected any of these experiments up to any prior art to any particular device in suit; they have merely given a few and some very poor demonstrations, I think, of some old laws of centrifugal force that we have known all our lives, or two or three hundred years old by Mr. Ooms' own statement, and which are not in issue in this case.

Mr. Ooms: If your Honor please, Mr. Castner testified in his deposition that there was no way you could make an

effective demonstration with the washing machine itself; that he had tried various things with the stroboscope and plastic machines, and found no way of doing it. So we have taken our next best step. We have disowned any intention to show anything arithmetically, but merely have
480 demonstrated the principles involved in the operation of these types of structure, each of which is clearly shown both by the witness' demonstrations and by the photographs offered in evidence.

Mr. Carlsen: Just to what purpose of your answer does all this so-called evidence relate? What part of your case is it? What does it establish? I have not connected it up with anything yet, and I don't know how the Court can.

Mr. Ooms: We have pleaded want of invention. We are showing that these structures whether made with the eccentric trap of the Castner patent, or whether made with the little trap of the Dunham patent, or whether made with the circular trap of the Dyer patent, or whether made with the circular trap and circular tubes of the Roth patent, all operate on essentially the same principle, do substantially the same thing in the same way; and we believe that the demonstration is relevant on the subject of the
481 common principle in all of these structures, which render plaintiff's structure unpatentable and lacking in invention.

The Court: Well, I don't think you can be harmed at all by their admissibility, and they will be admitted.

(Defendant's Exhibits I, J, K, K-1 to K-21, inclusive, L, M, N, O, P and Q were received in evidence.)

Mr. Carlsen: Am I to understand, Mr. Ooms, that you are contending that these are duplications of Dunham, Dyer, and so on—that is the first time it has been mentioned since these experiments started—that you can pick

up one tub and say it is Dunham or Dyer? At least, you inferred as much. This is the first time the names have been mentioned. If they are going to have any connection, I would like to have the witness connect it.

Mr. Ooms: The witness made it clear we were trying nothing by way of proportion, dimensions or arithmetical factors; that it was a demonstration of the principles
482 Castner said that he cannot demonstrate it with the machine; so we have done the next best thing to bring to your Honor machines that are built in different ways, that involve different structural principles. We have not attempted to copy dimensionally any of these machines, because there we run into the same problem Mr. Castner says you would run into. You cannot demonstrate them with the machine. We believe this demonstration demonstrates principles which are relevant and material in the operation of these machines, and that that is relevant to this suit.

The Court: Well, I said I cannot see how you can be harmed. Without ruling on the materiality at this time, they may be admitted.

(Defendant's Exhibits I to Q, inclusive, including Defendant's Exhibits K 1 to K-21, inclusive were admitted in evidence.)

483 Cross Examination by Mr. Carlsen.

Q. Dr. Colburn, have you ever seen a washing machine in which the spin tub, if you want to call it that, was mounted as you have mounted it in your Exhibit I?

A. No, I have not examined many machines as to their mode of mounting; but in those I have, they are not mounted exactly this way.

Q. You stated earlier in your examination that you had done some work for one of the plaintiff's licensees. Would you mind giving the name of that licensee?

A. This was the Barlow and Select Manufacturing Company, which I believe has changed its name to Speed Queen.

Q. Have you done any work for them in recent years?

A. No, I have not.

Q. None involving this matter of centrifugal forces?

A. Yes, I have done work for them in connection with their design of an automatic washing machine.

Q. Did that work have to do with a spinning tub?

484 A. No, it did not.

Q. Have you ever seen or heard of a washing machine in which the spin tub was mounted by springs above and below such as you have here?

A. No, sir.

Q. Have you ever seen a washing machine employing tubs similar to any of the tubs that you have demonstrated here; and if so, which ones?

A. Well, the word "similar" is confusing.

Q. Well, you give the definition, or you define it. How close to any of these glass cups here have you seen washing machine tubs proportionately designed like they are?

A. No, I have not seen any with those proportions. These tubs are deeper in relation to diameter than the others.

Q. And many of the proportions are entirely different than they would be in a full sized washing machine tub, are they not?

A. That is right.

Q. That includes size of tubes, model of tubes, and diameter of the holes?

A. Correct.

Q. And you, I believe, stated that one of the

485 critical factors in connection with centrifugal force

is the diameter from the center of rotation to the wall or the tube, whichever happens to be under consideration?

A. That is right.

Q. And that diameter in the demonstration you have made is two or three inches at the most, isn't it?

A. That is right.

Q. The radius, rather.

A. Yes.

Q. In a full size tub the diameter may be 2½ feet or so?

A. About, yes.

Q. So that you have entirely different working conditions in a full size tub than you do in these examples that you have demonstrated?

A. Have entirely different dimensions.

Q. I note also you referred to the fact that in the smaller tubs which you used to demonstrate the spiral tubes, you stated that those tubes were larger than the tubes you had used, for instance, in your Exhibit M. Is that right?

A. The location of the tube was at a slightly
486 greater distance from center.

Q. But the tubes themselves are of a larger diameter, are they not?

A. No.

Q. They are of the same diameter?

A. Yes.

Q. Then I misunderstood you. Have you seen any of the patents in suit?

A. Yes.

Q. The patents in suit as well as the prior art references?

A. Yes.

Q. Have you studied them all?

A. No, I have not.

Q. Did you take them into consideration when you were making any of these particular samples?

A. I studied the drawings in some of those patents.

Q. Did you study them in the Dunham patent and in the Dyer?

A. Yes.

Q. And was it the intention to duplicate some of the conditions from those patents in some of these models?

A. Yes.

487 Q. I notice in two of these demonstrations you made, namely, in the tubs marked N and O, there is a considerable amount of sediment left in the bottom of the tub and in the discharge tubes. As a matter of fact, Dr. Colburn, when you wiped the larger container out afterwards, you found some sediment on that towel that you used; but you had not wiped it out prior to that. So that sediment could have been from some other demonstration, could it not?

A. If I had not wiped it out between runs, then, of course, it could.

Q. But you still find a visible amount of sediment left in these samples?

A. Yes.

Q. How do you account for that, or don't you account for it?

A. Not all of the sediment is ejected.

Q. Do you know if you put any more or less sediment in that particular demonstration than you did in any of the others?

A. I have run the experiment a number of times, and never measured the amount.

Q. I am speaking of the tests that you made today.

488 A. I think you asked me to compare the other tests I made other times.

Q. No. I mean in the various tests that you made today, did you measure so you had the same amount of sediment each time?

A. No, I did not measure.

Q. So you could have had considerably more at some times than others?

A. I would not say considerably.

Q. There might have been some difference?

A. Oh, yes.

Q. I also noticed that in measuring the amount of water you put in you were quite accurate, when measuring the two spiral tube tubs that are shown by Exhibit I; but in the others, although you stated that you only filled them half full, or a little more, there was quite a variation in the amounts of liquid that you put into those various tubs. You did not measure the liquid you put in any of these tubs, did you?

A. I measured only in the case of the last demonstration.

Q. That is what I wanted to get in the record. Do you remember reading the Dunham patent?

489 A. No, I never read the patent.

Q. Did you see the drawings in that structure?

A. Yes.

Q. Were you informed, or did you know that one of the main purposes of the so-called tubes in that patent was to define the liquid level of the water in the tub?

A. I don't know that from reading the patent, but to me it makes sense.

Q. That makes sense to you, does it?

A. Yes.

Q. Now, then, in many of your demonstrations, as a matter of fact in most of them, when you started out the liquid level was less than half way up the tube in many instances; so you were starting out with a much smaller body of water than Dunham had, for instance, if what I just said was true, that they were liquid level determining devices?

A. Yes, I have a much smaller body of water anyway.

Q. So that the conditions you were starting with were quite different in that respect than they would have been in the Dunham patent?

A. Different in quantity and dimensions.

490 Q. That would also be true with reference to the Dyer patent, perhaps?

A. That is right.

Q. Now, let us get away a little from the mystic aspects of this thing, and see if we cannot be a little more practical in our consideration of these problems, Doctor.

Have you examined these tubs that are in evidence here well enough to understand how they work, and so on?

A. I have given them a superficial examination.

Q. Now, I am going to show you section way tubs that have been offered in evidence as Plaintiff's Exhibits 14 and 18, with the agitators set in there. Now, you are familiar with this general type of washing machine tub, are you not?

A. Yes.

Q. Now, in both of these instances, and notwithstanding your demonstrations, we don't, we cannot see exactly what happens in these tubs during the wa ing operation, can we? I mean, you cannot see what happens with reference to the soil that is removed from the clothing?

A. No, you cannot.

491 Q. Incidentally, in connection with your demonstrations, there weren't any of them, were there, that had anything to do with the disposition of the scum? I don't believe you even referred to that in your demonstrations.

A. That is correct.

Q. Now, we will get back to Plaintiff's Exhibit 14 here, and I am correct that you said that we cannot see exactly what happens here, we have got to use a little common sense, and that is all we can use all through this case, if we can limit ourselves to that. The clothes are being washed by an agitating action, is that correct?

A. Yes.

Q. And they are moved in what is sometimes referred to as a toroidal movement, is that correct?

A. To some extent they are.

Q. And as they are being washed in soap and water, some of the soil or the dirt comes to the top of the surface and some goes to the bottom, is that right?

A. Yes.

Q. And the soil that goes to the bottom comes in contact with what we have been referring to as the

492 dished bottom of the tub, is that correct?

A. Yes.

Q. And, that is just as true of the defendant's structure, Exhibit 18, as it is of the plaintiff's structure, is it not?

A. Yes.

Q. Some of the dirt will also hit the skirt of the agitator that com. down, would it not?

A. Yes.

Q. And that heavier soil meets where it comes to-

gether at the rim of the agitator; that is the same in both cases, would it not be?

A. No. I think the particles of soil are continually buffetted around you seem to be asking specifically about two paths which meet at some point. I don't think there is any stream of particles going in one direction.

Q. I am concerned mostly with the soil that hits this what we call the dished bottom. It at least moves downwardly until it gets to the vicinity of the agitator rim?

A. That is approximately the movement.

Q. And that is true of both plaintiff's and defendant's machines?

493 A. Yes.

Q. And in fact it is true in both of these first and second designs, isn't it?

A. Yes.

Q. When that dirt gets down there, the scum, that light scum and oil, comes to the top?

A. Some of it.

Q. Some of it will stay in suspension possibly?

A. Yes.

Q. Now, when the spinning action starts, or before the spinning action starts, some of that soil, the heavier soil, has gotten under the rim of the agitator in both devices, has it not?

A. Yes.

Q. And it has gotten into what we call the annular sediment trap?

A. Right.

Q. That is true in both cases?

A. Right.

Q. So when you start the spinning action, it throws the sediment out through the tubes and throws the scum and

main body of the water out above the upper edge of the tub, is that right?

A. That is right.

494 Q. So that all this explanation up to this point is the same in both cases, is it not?

A. Yes.

Q. And the only slight difference is that the movement of the soil from the under edge of the agitator into the sediment trap has more clearance in the plaintiff's device than it does in the defendant's?

A. Yes.

Q. Now, if we take the defendant's machine, take the agitator off, you will note that Mr. Dugger drew a red line right along through some of the perforations in the bottom of this dished portion.

A. Yes, I see it.

Q. Now, it would not be a difficult matter, with your engineering experience at least, to fasten this tub to the base plate in some other manner except by these stud bolts, would it?

A. I suppose.

Q. It could be done in a lot of ways?

A. Yes.

Q. Let us assume that it is done in some other way, and I have those bolts out of here. Then let us assume

495 we are cutting the bottom of this tub off at that red line all the way around, so that we can remove this strip of metal, this round strip of metal, from the tub. Would you not then have a condition substantially identical with the plaintiff's tub?

A. Yes.

Q. And substantially identical with the Castner patent disclosure?

A. While I have seen the drawings of those patents, I have not read them; so I don't think I am in a position to pass on whether it is identical with the patent or not.

Q. But if we put this rim back on here, or if we put it in the plaintiff's structure, we are merely adding something to the structure that was not there before?

A. Absolutely.

Q. And when we do that, we may add a guard or a screen, call it what you want, something to prevent bobby pins and buttons, one thing or another, from getting into the trap. Would that be a correct statement?

A. That could be a purpose.

Q. Does it have any other purpose, this rim I
496 am putting back in here?

A. In this case it obviously has the purpose of supporting the tub.

Q. Assuming we support the tub in some other way.

A. I cannot imagine any other purpose except to retard the flow of the water.

Mr. Carlsen: That is all the cross examination.

The Court: Anything further?

Mr. Ooms: I want to ask a couple of questions, your Honor.

Re-Direct Examination by Mr. Ooms.

Q. You were asked about measuring the sediment in these tubs as you ran them. Does the amount of sediment in any way affect the principle of the operation, Doctor?

A. No, it does not.

Q. It was also pointed out that you had measured the water very carefully in the last demonstration with tubs P and Q, and had made no such precise measurement on earlier tubs. Why was that done?

A. In the case of these last tubs, P and Q, I was
497 trying to limit the experiment to only one difference, one variable, the tilt of the tubs. I wanted everything else in both of the tubs to be identical.

Q. And did you make them identical in every respect except the direction in which the tubes ran?

A. Yes, I did.

Q. And you were also asked whether or not these things were all operated under different working conditions from standard machines, and I believe you said the dimensions were different. What did you mean by pointing that out?

A. Well, these are smaller than other machines, than commercial machines. The ratio of height to the diameter may or may not be the same. Commercial machines vary in that respect. The radius to the outer tube as compared to the radius of the tub is different in these different models, different from each other, and different from the commercial machine.

Q. How does the principle of operation with respect to discharge of water over the upper edge of the tub
498 and discharge of water through the sediment trap on these models, Defendant's Exhibits L to Q, compare with the principle of operation with respect to disposal of the water over the upper edge of the tub and disposal through the sediment trap in the commercial wash machine?

A. The principles are the same, and the action was the same.

Mr. Ooms: That is all.

The Court: Anything further?

Mr. Carlsen: May I have one more question?

Re-Cross Examination by Mr. Carlsen.

Q. Dr. Colburn, I want to show you Defendant's Exhibit 11, the photograph, and also a copy of the Dunham patent 2,274,402, and ask you if you believe that the holes in the bottoms of those two tubs are proportionately of the same size?

A. You also mean proportionate to the size of the tub?

Q. Right.

A. The answer is, they are not.

Q. In fact, there is a very, very substantial dif-
499 ference, is there not?

A. Yes.

Mr. Carlsen: This is Exhibit 11 of Defendant's Exhibit K.

The Court: Is that all?

Mr. Carlsen: Yes.

Re-Direct Examination by Mr Ooms.

Q. Mr. Colburn, does the relative dimension of the holes in relation to the diameter of the tub in any way affect the principle of the operation of the structure which you demonstrated as Defendant's Exhibit N?

A. It does not.

Mr. Ooms: That is all.

(Witness excused.)

500 The Court: How many more witnesses have you?

Mr. Ooms: I don't think I have but two or three more. I have in the jury room a large washing machine we would like to have you look at. It is made of plastic.

Then we have an actual Easy machine of the spiral type, in which we do this:

We first run it as it came from the factory. Then it takes

the boy about ten minutes to change the tubes so instead of trailing they lead, and the same machine is operated under identical conditions otherwise.

The only purpose of the demonstration is to show there is no observable difference between the rate of speed at which the water comes out of those two types of tubes.

Maybe counsel will stipulate that, and we can omit it.

The Court: Talk about it after we suspend.

Mr. Carlsen: We will not stipulate to any tests that have not been any better than those we have seen today.

I would like a ruling on one matter, and that is with
501 reference to this book you have referred to as Defendant's Exhibit F. I don't believe it was offered in evidence. Was it?

Mr. Ooms: Yes, it was, I believe. The large charts I did not offer: I offer the book of original patents, Defendant's Exhibits A to E, inclusive, and I offer this book with the colored charts as Defendant's Exhibit F.

Mr. Carlsen: If I did not make any objection, I certainly should have.

I have no objection to drawings or anything there reproduced from drawings in the patents, but I certainly do not intend to stipulate to the accuracy of your color scheme here, Mr. Ooms, or the quotation that you have made as being the only representative parts of those various specifications that should be considered.

Mr. Ooms: I think it made it clear that the only purpose of the color, like the color in the charts of plaintiff's exhibits, was to point out these essential features, and then we added in the claims, all of which are copied photostatically. On some the claims are typewritten. We merely indicate in color what we say is the response. That is just what plaintiff's exhibits did.

Mr. Carlsen: Plaintiff's exhibit was submitted to
502 cross examination, and yours were not.

Mr. Ooms: I am making no pretense. I am telling the Court clearly what it is for, and you say you do not stipulate to the accuracy of anything. I detailed very precisely here when I offered the patents, what portion of the patents I would rely on. I don't think there can be any question or mistake about that.

The Court: I can't keep track of all the exhibits. I don't recall whether that was offered in evidence.

Mr. Carlsen: I don't think it was either.

The Court: You determine that by tomorrow morning, and I will rule on it.

How much rebuttal do you think you will have?

Mr. Carlsen: Possibly half or three-quarters of an hour.

The Court: Tomorrow morning, ten o'clock.

(Whereupon an adjournment was taken to 10:00 o'clock a.m. of the following day, April 27, 1956.)

* * * * *

504 The Court: You may proceed.

Mr. Ooms: At the close yesterday there was some question about whether Defendant's Exhibits A, B, C, D, E and F were offered. The reporter has checked and found they were offered.

Now, there was no objection made and there was no ruling, and I assume that under our practice here they were admitted under the circumstances; but counsel, I think, still wants to object to Defendant's Exhibit F.

I would say if there is a question raised about it, we can brief that with the other evidential questions in our briefs.

The Court: I thought about that last night after the short discussion; and while you were presenting that, it occurred

to me, and I was wondering why there was no objection, because counsel had no means of cross examining on the document.

Mr. Ooms: There was nothing in the charts except the color that was added to the photographic reproductions from the patents.

Mr. Carlsen: I possibly went on an erroneous assumption; but I certainly assumed, as in all these patent
505 cases, when they bring in colored charts, maps and whatnot, somebody is going to talk about them. Frankly, I do not remember discussing Defendant's Exhibit F when it was presented and marked. I did not know that it was being offered at that time. If I am too late to make the objection, I withdraw it.

Mr. Ooms: I would not stand on any such technical position, your Honor, as to say he is too late to make the objection. I would prefer, however, if there is to be a question, that we brief it in our briefs. There is nothing in it except the color that has been added to the photographic reproductions from the patents, to show the position of the defendant of where the elements are found. There is nothing argumentative about it; it is just a quick means of seeing what we say are the similarities in the different structures.

The Court: Why, I say, I agree with your adversary that usually a witness is put on in a patent case where there are showings of similarity or dissimilarity to testify to that.

Mr. Carlsen: If it were a difficult case, it would be quite necessary.

The Court: All of these cases are difficult. There is
506 no easy road to any of them that I can see.

Mr. Ooms: I think the documents can speak for themselves.

The Court: I think I will admit it, and then you can move to strike, and on that you can brief it.

Mr. Carlsen: There is one other undetermined matter that we discussed yesterday which you may want to pass on now, and that is with reference to the objection which I made yesterday, and which I wish to renew, with reference to Defendant's Exhibits I to Q; and I also in connection with that move to strike all of Dr. Colburn's testimony in connection with those demonstrations, for two or three specific reasons, which I will merely state but not argue at any length.

In the first place, it has not been shown that these exhibits and his demonstrations made in court have any relevancy to a single pleaded issue in this case.

Secondly, by the witness' own admissions, he was familiar with certain prior art disclosures to which certain of his models have a superficial resemblance, and yet
507 the equipment he used cannot possibly demonstrate what would happen in any one of those prior patent devices. The witness admitted no attempt was made to follow the dimensions, sizes or proportions and that some were greatly distorted. The samples which he used in many places in the demonstrations proved nothing, because in some instances no sediment was used at all; and others where sediment or carborundum was used, much or all of it remained in the tub or tubes, and was not discharged at all. So, such demonstrations are not effective for any reason that I could see to support defendant's position.

The Court: As to your second ground, at least, that goes to the weight rather than the competency, I would think. Your objection on the other, that will be denied.

What did you say—you did make a statement yesterday of the purpose for which you offered the tests.

Mr. Ooms: Yes, I can state it. Notwithstanding our position, as stated at the opening of this case, Mr. Castner made no invention, that he merely changed the set-up of the

sediment trap in the bottom of the washer, and that was based on the Dunham patent. Castner when exam-
508 ined said there was no way of demonstrating how these things worked from the wash machine itself; you had to do it with a stroboscope light and plastic machine.

All we are trying to show is that these machines, all of which are merely spinning tubs, like the spin tub in a washing machine, with some kind of trap at the bottom, will discharge water over the top and through the trap; and if it discharges water, it will carry sediment, he said; and Dr. Colburn was very meticulous in stating that he was not attempting to reproduce measurements, not attempting to demonstrate any arithmetical values; he was merely trying to show that all of these structures though different in form operated in the same way and under the same principles of hydraulics which have long been known. That is all the purpose of it was. We did not make any attempt to show one was more efficient than another, because that is merely difference in degree to which the patent law does not attribute patentability.

The Court: He did testify—I don't know what term he used, size or dimension—

Mr. Ooms: Proportions and dimensions.

The Court: He did say it would not make any dif-
509 ference.

Mr. Ooms: That is right.

The Court: Whether it was large or small.

Mr. Ooms: That is correct.

Mr. Carlsen: I don't propose to labor the argument any longer, except to add this one additional observation, that the defendants like we were preparing to try the case quite some time ago, but this is purely an ex parte demonstra-

tion that you saw. We have had no opportunity to see it before the last hour yesterday, and obviously we cannot get in an expert now to study that, and make our own definite test to see whether or not the demonstrations were proper even as they appeared.

Mr. Ooms: I don't think they are ex parte when they are made in open court. They certainly are not ex parte when we then offer the mechanism to counsel and said we would make any demonstration he wanted to make on it, and he did not want it. Now, I cannot see that that affects the situation.

The Court: Well, are you asking for a continuance?

Mr. Carlsen: No, sir.

The Court: If you are not, I will overrule the objection, and they may go in.

Mr. Ooms: I have just a few formal offers which
510 I would like to defer a few moments, and one principal witness, who has been sworn; and I want to say briefly I am going to put him on the stand to tell us what he is going to do—we have a machine in the back room which he will describe and tell your Honor what he is going to do with it.

I would like to do that first; and then, if your Honor would be agreeable, to step down and see the machine run. Then while he takes about ten minutes to change the direction of the tubes below, I would like to make my formal offer; and then if your Honor can be asked to step down again, he will run it again with the tubes changed.

I might add my reason for putting him on first is so that when he describes the demonstration as he is making it, if counsel for plaintiff wants him to make any variation, change or different demonstration, we shall be happy to accommodate him. It is a very brief demonstration.

511 CHARLES W. WALDROP, called as a witness on the part of the defendant, being first duly sworn, testified as follows:

The Court: What is your name?

The Witness: Charles W. Waldrop.

The Court: Where do you live?

The Witness: Herrin, Illinois.

The Court: What do you do?

The Witness: I am supervisor of the experimental shop.

The Court: What is the name of the company?

The Witness: Norge Division, Borg-Warner Corporation.

The Court: You are the supervisor of what kind of a shop?

The Witness: Experimental.

The Court: You may proceed.

Direct Examination by Mr. Ooms.

Q. Mr. Waldrop, what has been your education?

A. High school, and experience at the Norge plant in Herrin since September 25, 1947.

Q. What was your work at Norge when you first joined them in 1947?

512 A. When I first joined them at Norge I was operator in the plant for nine months.

Q. When did you go into the experimental shop?

A. Approximately August, 1948.

Q. Have you been there ever since?

A. I have.

Q. And what do your duties in the experimental shop involve?

A. We build up various models of future production and test the present models.

Q. Did you have any experience with machines other than those which the Borg-Warner Corporation built?

A. Yes.

Q. And is there any way to select those, or what is the range of the machines?

A. We try to have most of the major competitors' machines in the shop at all times.

Q. Did you get new ones from year to year?

A. Usually, yes.

Q. Mr. Waldrop, you have brought with you a machine which is in the jury room. Will you identify that mchine for us so it will be known as to make, year and model?

513 A. That is an Easy machine which we received in approximately the latter part of 1953.

Q. And where has it been since that time?

A. It has been in the experimental shop at the Norge plant in Herrin up until the time that the Patent Office in Chicago of Borg-Warner asked it be sent to them.

Q. Now, I notice in looking at that machine in the back room that part of the casing has been removed. What has been removed from the machine?

A. Part of the casing has been removed, but nothing that affects the spinning operation or mechanism.

Q. Is the machine in so far as the operations of the spinning cycle is concerned in the condition it came to you originally?

A. It is.

Q. Does it have a sediment trap on it?

A. It does.

Q. What kind of sediment trap, open or closed?

A. It is an open sediment trap.

Q. Completely annular in the tub?

A. It is.

Q. What kind of discharge tubes does it have?

A. It is a spiral type, with the discharge end of
514 the tube trailing.

Q. I have before me, Mr. Waldrop, Plaintiff's Exhibit 17, which has been introduced here as the second of the Beam type of tubs. How does the tub which you have in the machine in the jury room compare with this?

A. It appears almost identical.

Q. And what about the tube?

A. The tube is almost identical, if not identical.

Q. Now, I have asked you to prepare to make a demonstration with those tubes in the trailing position. What will your demonstration consist of?

A. In the demonstration I will put four gallons of water in the basket along with a measured amount of sand into the trap. After doing that we will extract the water and also the sand.

Q. How will you extract the water and the sand?

A. By spinning of the cylinder.

Q. What do you use to spin the machine to do that?

A. The mechanism as it came from the factory.

Q. Is that a machine with a fluid drive on it?

A. That is correct.

515 Q. Now, will you have the agitator in or out of the machine when you do that?

A. It does not make any difference whether the agitator is in or out. I prefer to leave the agitator out so it can be more readily seen.

Q. Do you have some kind of cover so the water will not spray the spectators when you operate this?

A. Yes, I do have.

Q. Transparent?

A. A transparent cover.

Q. Now, Mr. Waldrop, I am going to ask you to make a second demonstration with that machine after you have made a change. Will you please describe for us what change you will make in the machine, and what demonstration you will make?

A. The change that I will make in the machine is that I will install a tube as nearly the level as possible of the tube that is now on the Easy machine so that the discharge end of the tube will be leading the inlet of the tube.

Q. Who made the second tube?

A. I did.

Q. What pattern or design did you follow when you made it?

516 A. The tube that is now in the Easy machine.

Q. And as I understand it, you made it with the outlet leading instead of trailing, with the curvature as nearly like the original tube as possible?

A. Correct.

Q. What will your demonstration consist of after you have installed that on the machine?

A. I will again put in four gallons of water, a measured amount of sand, and spin the tub to extract the sand and water.

Q. Are you prepared to make that demonstration now?

A. I am.

Mr. Ooms: If counsel wants to ask any questions first, or suggest any change, we would be happy to have that at any time.

Mr. Carlsen: I would rather examine him when he gets through.

Mr. Ooms: You may step down. How long will it take to get ready?

The Witness: About five minues now, or less.

(Witness withdrawn from the witness stand.)

517 The Court: Are you ready for the demonstration now?

Mr. Ooms: Yes, sir.

(Whereupon the Court, counsel, the witness, and other interested parties retired to the jury room to witness the demonstrations referred to.)

518 CHARLES W. WALDROP, a witness on behalf of the defendant, having been heretofore duly sworn herein, testified further as follows:

Direct Examination by Mr. Ooms (ctd.).

Q. Will you point out what you have done to this machine with respect to filling it?

Mr. Ooms: If your Honor would step up here.

A. I have put in a measured four-gallon amount of water, in the spin basket of the machine. I have also added a measured amount of sand.

Q. What do you mean by measured amount?

A. Since this is for comparison, I will put in the same amount in each machine.

Q. Was there any reason why you put in four gallons of water?

A. No, no reason at all, just to have a figure and know we are using so much water is the only reason.

Q. You have put on right here some electrical device. What is this?

A. That is a stroboscope.

Q. What does it do?

A. With it you can determine revolutions per min-

519 ute of the basket.

Q. How is that done, Mr. Waldrop?

A. This light or stroboscope goes on and off at a setting given here. As this object is moving at the same revolutions per minute, this has the appearance of standing still.

Q. From that what can you determine?

A. You can determine revolutions per minute.

Mr. Ooms: Do you have any objection if Dr. Colburn holds the light and operates it?

Mr. Carlsen: I have no objection. I would ask the witness what the usual amount of water is in a machine.

The Witness: That varies probably from 11 to 17 gallons of water.

Mr. Carlsen: Different machines?

The Witness: Yes.

By Mr. Ooms:

Q. What is the usual amount for this machine?

A. I could not say exactly, but I would say approximately 15, 17 gallons of water.

Q. Could you run the same demonstration with a full load?

520 A. I could.

Q. How much longer would it take?

A. It would probably take five minutes to get the additional amount of water in.

Q. How much longer would it take to discharge?

A. As far as the water discharging is concerned, it would probably would not take more than ten or fifteen seconds longer.

Q. Would it affect the demonstration in any way?

A. It would not.

Mr. Ooms: Do you want to suggest anything there?

Mr. Carlsen: I see no reason for not putting in a total amount of water so we have something resembling a regular washing operation.

Mr. Ooms: We can do that.

Mr. Carlsen: We have reason for thinking it will make a difference.

Mr. Ooms: All right, sir.

(Witness pours additional water into machine.)

Mr. Ooms: What is the total now?

The Witness: Twelve gallons.

521 Mr. Carlsen: That is sufficient as far as I am concerned.

By Mr. Ooms:

Q. Will you tell, please, what you are doing, Mr. Waldrop?

A. I am now placing a plastic cover over the top of the tub to keep the water from splashing out during the spin cycle. I also have in my hand a stop watch.

Mr. Ooms: Do you want a stop watch, Mr. Dugger?

By the Witness:

A. (continuing) With this stop watch I have in my hand, I am going to measure the length of time that the water comes from the tube.

By Mr. Ooms:

Q. Before it comes from the tube?

A. No. I will wait until water starts from the tube and stop the stop watch at the time the water stops.

Now there is water coming out of the tube.

Now the water has been drawn from the sump by this time.

522 Q. Did you read the speed of the strobolight to determine how fast you had been running the machine?

A. The machine is not up to that speed as yet.

Q. How fast is it running?

A. The machine is now running approximately 640.

Q. Did you observe it while the water was being drawn out?

A. The stroboscope?

Q. Yes.

A. The stroboscope will give you a reading at full speed of acceleration.

Q. As long as it was accelerating, the stroboscope would not show, of course, any speed until it has come to a stable condition, would it?

A. The stroboscope would not show the speed until it reaches 600 RPM.

Q. Did it reach that while throwing water?

A. It did not.

Q. Did you measure the time in which the water flowed out of the tube?

A. As best I could, I did.

Q. What was your reading?

A. 31 seconds.

523 Mr. Ooms: Do you have any different reading, Mr. Dugger?

Mr. Dugger: I couldn't tell when the water stopped going out of the tube. I couldn't see the end of the tube. It went around so fast, and the water discharging from the holes in the tub at approximately the same level, I couldn't distinguish one spray from the other.

By Mr. Ooms:

Q. How did you determine when the water stopped running from the tube?

A. I determined that by the sump being dry, no water in the sump.

Q. Was that the time when you called during the demonstration that the sump was dry and no more water was coming out?

A. That is right.

Q. Will you now look into the tub of your overflow, and tell us what you find in it?

A. I see a great deal of sand in the bottom of the tub.

Q. When the tub comes to rest, will you examine the sediment trap, and tell us what you find in it?

524 A. There is no sediment in the trap.

Q. How long will it take you to put on the other tube, Mr. Waldrop?

A. About ten minutes.

Mr. Ooms: Does counsel for the other side want any other tests run with the tubes in the trailing direction?

Mr. Carlsen: No, I have no desire. It is your test, you demonstrate it as you wish. I have not discovered anything I did not know yet. Maybe some of the rest will.

Mr. Ooms: I merely make the offer before we disassemble it, if there is anything different you want done, it can be done now.

Mr. Carlsen: No.

Mr. Ooms: May we have a recess, your Honor, and may we call you then when we are ready?

The Court: Yes. Let the marshal call me.

(Whereupon a short recess was taken, after which the following:)

525 By Mr. Ooms:

Q. Mr. Waldrop, before you begin, what have you put into the tub?

A. I have put 12 gallons of water in the spinner basket of the Easy machine, along with a measured amount of sand.

Q. What was that measured amount of sand?

A. The same amount as we used in the previous test.

Q. How does the amount of water compare with what you put in the previous test?

A. The same.

Q. What change did you make in the machine during the recess?

A. I took off the tube that had the discharge end of the tube trailing the inlet, and replaced it with a tube as nearly alike as possible, with the exception that the discharge end of the tube is leading the inlet of the tube.

Q. I noticed during the recess that you slightly deformed the mouth of the tube. Why was that done?

A. To make them more nearly alike.

Q. Was the mouth deformed in the original tube?

A. Yes, it was.

526 Q. What do you propose to do now?

A. I will now put the plastic cover over, back over the spinning basket, to keep from raising any of the water over the side.

I will now run the machine for spinning the spin basket of the Easy machine, discharging and ejecting the water and sediment.

Q. Will you use your stop watch as you did in the other test?

A. I will use the stop watch as I did in the other test.

Q. Where is the water coming from?

A. The water is coming both over the top and through the discharge tube at the present time.

Q. Call us when it stops coming from the sediment trap through the tube, will you?

A. Now.

Q. What speed is the machine running at at the moment, can you tell?

A. We can't meter it.

Q. What is the condition of the tub now?

A. The tub is empty of water.

Q. What is the speed of the tub at this time?

A. It has still not reached a readable speed.

527 Q. How does the speed of the tub compare with its speed in the previous operation?

A. No observable difference.

Q. Did you look at your stop watch to see how much the time, the elapsed time for the discharge of the tube was?

A. It is 25 seconds.

Q. At what speed is the machine running now?

A. The machine is running here about 660 revolutions per minute.

Q. Mr. Waldrop, I would like to have you look into these stationary tubs we have here, and tell us what you find in this second tub.

A. There are deposits of sand in the bottom of the second tub.

Q. While you are observing the tubs, observe the levels, and tell us what you can say as to the amount of water that was run through the machine in each operation.

A. I would say the amount of water was equal.

Q. Is there any higher level observable in either one?

A. There is not.

528 Q. Now, what is the condition of the sediment trap?

A. The sediment trap is free of sand.

Q. Now, when you had the tub off and were able to examine the casing or outer tub, what did you find in the bottom of the tub?

A. There were large deposits of sand.

Q. Where did that come from?

A. It came from this test, previous test that we have made in this machine.

Q. How did it get out of the tub into the outer tub, out of the spinner tub into the outer tub?

A. In two ways, either over the top or throught the sediment trap.

Q. When it comes over the top, what carries it over the top?

A. Centrifugal force and the water.

Mr. Ooms: That is all.

While the machine is in this condition, Mr. Carlsen, do you care to have any other experiments made?

Mr. Carlsen: No, but I would like to ask the witness a question or two here.

529 Cross Examination by Mr. Carlsen.

Q. Did you say that there was sediment in the bottom of the tub after each test you made?

A. I did not say that, no. I said when I had the tub off from the shaft there was sediment in the bottom of the tub, between the tub and the outer casing.

Mr. Carlsen: That is all the questions I have here.

(Whereupon the hearing was resumed in the court room, and the witness returning to the witness stand, testified further as follows:)

Cross Examination by Mr. Carlsen (ctd.).

Q Mr. Waldrop, in these two demonstrations which you have just made, if my notes are correct, you found that the discharge tube emptied in 31 seconds in the first test and 25 seconds in the second test. Is that correct?

A. That is correct.

530 Q. In other words, when you reversed the tube so that it had a forward direction with respect to the direction of travel with the upper end, it seemed to work

better than when you had it in the trailing direction, is that correct?

A. From all appearances, yes.

Q. That being the case, do you know why your company doesn't always make it that way?

A. I do not know.

Q. You are in general familiar with the Roth patent, are you not, to know that that is what it covered, the trailing type?

A. All I know about the Roth patent is what I have heard here.

Q. Now, in making these tests there were no clothes in the tub?

A. No, there were not.

Q. In fact, there was no agitator?

A. No agitator.

Q. No detergent?

A. No detergent.

Q. No soap, safety pins, or buttons, or anything you might find in a normal washing operation?

A. Correct.

531 Q. And taking your reading on the cyclometer, was I correct in understanding that you could not take any reading until you got up to revolutions per minute of about 650?

A. Approximately 600.

Q. So that you could not determine what happened prior to that time relative to speed?

A. That is correct.

Q. When you gave your version or estimate as to the length of time it took to empty the tubes in either demonstration, the only observable thing that you could rely on was what you saw in the bottom of the tub, was it not?

A. Will you repeat the question, please?

Q. Well, in determining when the flow started and stopped from the tubes you depended entirely upon what you saw in the bottom of the tub, didn't you?

A. On the beginning of water discharging from the tube, I checked the tube, checked the outcoming water of the tube; as far as checking when the water stopped, that is when the sump became dry.

Q. Are you implying or telling us that you could tell when the water first started to come out from the
532 tube by looking at the upper end of the tube?

A. I would say within a very small amount of time, split second, you can see that.

Q. Was that before or after the water started discharging from the upper end of the tub?

A. That was before.

Q. How long before?

A. I can't answer that.

Q. You did not time that?

A. I did not.

Q. Did you hear Mr. Dugger's testimony about the advantage he found in the trailing type of a tube during the initial period of acceleration?

A. I don't recall that, although I am sure that I probably heard it, but I don't recall it.

Q. And since you cannot take any tachometer reading until you get to a relatively high speed, there is no way that we could determine from your experiment just what happens in that tube, as to the tube, during the initial period of acceleration, is there?

A. There is no way to determine the speed during the time the water is being discharged from the tube. At least, we have not done that.

Q. And there is no way of determining just what
533 time during the spinning cycle the sand is discharged from the sediment trap?

A. There is no way of telling the exact time the sand is discharged, no.

Q. Have you seen a number of different makes of washing machines having this general type of equipment in which the trailing type of tube is used?

A. No, I have not.

Q. I thought you said you had these various machines in your laboratory.

A. We have several machines in our laboratory, but I have not seen several of this type machine.

Q. How many have you seen?

A. This is the second.

Q. You have seen then the trailing type of tube on one other machine?

A. That is on a later model Easy.

Q. A later model Easy?

A. Yes.

Q. And you have seen it in the Norge machine, have you not?

A. No, I have not.

Q. Do you mean by that statement that Norge does not put out machines on which the trailing end of this
534 tube is behind the water-receiving end of the tube with respect to direction of travel?

A. I don't feel I am qualified to get into the principles of the construction of the machine.

Q. I am not asking you anything technical, Mr. Witness. I am merely asking you if you have not seen a lot of Norge machines, such as we have here in Plaintiff's Exhibit No. 19, in which the discharge end of the tube is

behind the water-receiving end of the tube with respect to direction of travel. You can understand that question.

A. I have seen several machines with the tube you have just described.

Q. And they have been making them for quite some time now, haven't they?

A. Correct.

Q. Have you ever seen, or even heard of any commercial type of machine in which this tube has the reverse direction, namely, that the outlet end is in advance of the water-receiving end, such as you have shown in your second demonstration?

A. I have not.

Mr. Carlsen: That is all.

535 Mr. Ooms: No re-direct examination.

(Witness excused.)

Mr. Ooms: I would like to offer in evidence the two tubes off that machine, not the whole machine, but the two tubes, as Defendant's Exhibit V and V-A.

Mr. Carlsen: No object.

(Defendant's Exhibits V and V-A were received in evidence.)

536 Mr. Ooms: I would like to offer as Defendant's Exhibit H-B the Beam tub which was examined by Mr. Gerhardt when he testified yesterday, and as to which he gave us cost figures to assemble the tube which is in evidence as Defendant's Exhibit H-A with the associated parts Defendant's Exhibit H.

Is there any question about the authenticity of it, Mr. Carlsen?

Mr. Carlsen: No objection.

The Court: It may be received.

(Defendant's Exhibit H-B was received in evidence.)

Mr. Ooms: I would like to offer in evidence as Defendant's Exhibit R the circular—

"The new Deluxe Easy Spiralator Automatic Washer"—

Model ADE, which was referred to by the witness Castner during the taking of his deposition last week.

The Court: Any objection?

Mr. Carlsen: No objection.

The Court: It may be received.

(Defendant's Exhibit R was received in evidence.)

Mr. Ooms: And as Defendant's Exhibit R-A the
537 circular—

"The New Custom Easy Spiralator Automatic Washer"—

Model ACE, referred to by the witness Castner when his deposition was taken last week.

Mr. Carlsen: Your Honor, I think it would save time. I will have no objection to any of these circular exhibits, provided, of course, we can check them with the actual circulars Mr. Castner testified about.

Mr. Ooms: Certainly.

The Court: All right.

(Defendant's Exhibit R-A was received in evidence.)

Mr. Ooms: We offer in evidence as Defendant's Exhibit S, the circular of 32 pages—

"Speed Queen, the Royal Family of home laundry equipment"—

referred to by the witness Castner when his deposition was taken last week.

The Court: It may be received.

(Defendant's Exhibit S was received in evidence.)

Mr. Ooms: As Defendant's Exhibit S-A, the Speed Queen

circular—

538 "Speed Queen Automatic Washer * * * Stainless Steel"—

referred to by the witness Castner.

As Defendant's Exhibit T, a circular entitled—

"Beam Automatic Washer"—

referred to by the witness Castner in his deposition.

And as Defendant's Exhibit U the cover and page 15 of a circular delivered to counsel by Mr. Hubbard of the Hotpoint Company when he testified here this week, the circular being entitled—

"Hotpoint 1956 automatic washers service manual."

(Defendant's Exhibits S-A, T and U were received in evidence.)

Mr. Ooms: I would next like to offer in evidence the cross examination of the witness Castner, which is Volume 2 of the original deposition transmitted here this week; and it is a matter of indifference to me whether it is copied into the assembled value with the rest of the examination, or it is used as a pamphlet. If the Court has any preference, or counsel, I will be happy to comply with either.

Mr. Carlsen: I have no preference, your Honor. The only additional suggestion I might make at this time is

539 that while he is offering the cross examination, I would also like to offer the direct examination, together with one exhibit, Plaintiff's Exhibit 39, which was identified at that time.

Mr. Ooms: I have but one objection. Of course, I have none to this volume which contains the re-direct examination going in with all of the re-direct; but I do have one motion I wish to make in connection with the cross examination and the re-direct and the exhibit that counsel wishes to offer; and that is the motion which was made during

the re-direct to strike certain testimony about the exhibit which counsel offers, and if I may call it to your Honor's attention a moment, we can either handle it in the brief or now; but I had asked the man about an Easy washing machine, and he went off in a long discourse about an advertisement he had found in an Iowa newspaper of the Norge machine, and suggested the Federal Trade Commission was interested in it. The matter which I object to runs from the fifth line of the answer to cross question 194 on page 153 of the deposition to the second line of cross examination question 198 on page 155; and the re-direct, which I move to strike on the same grounds, are
540 re-direct questions 10 to 12, on pages 197 and 198 in the deposition, which also involved the offer of Plaintiff's Exhibit 139, at which time the objection was made.

Mr. Carlsen: I don't believe your Honor can pass on that without reading the testimony itself. We think it has some bearing on the case, because it shows the Norge Company, aside from not having the cleanest hands probably, did sell washing machines that they even called automatic machines that left off some features in order to have a step up situation which they have in this retail market.

In this particular case they call it an automatic washing machine, and down at the bottom you will find it is a push button machine, and Mr. Castner described that as not being an automatic machine, and that is why it was objected to by the industry; that type of advertisement was objected to at the time. But, in any event, it does show it was not a general situation for washing machine people to leave off even good features from time to time to have a sales story to tell the public.

Mr. Ooms: I think we can brief that also when we sub-

mit our briefs.

541 The Court: There was some testimony, I have forgotten on whose behalf, with reference to some advertisement that was admitted, that was offered and admitted, where some parts of that were left off.

Mr. Carlsen: The tube was left off in some instances. He said that it only cost forty to seventy-five cents. They wanted to have a deluxe feature not found in the lower priced machine. The value of the element left off has nothing to do with the difference in price, of that I am sure.

Mr. Ooms: If this had anything to do with the sediment trap, I would have no objection to it, but it has nothing at all. We can handle that on briefs.

The Court: You can do that.

Mr. Ooms: Then I offer in evidence and ask the reporter to copy into the record this short earlier deposition of Mr. Castner, taken on April 10, 1955—the complete deposition is just about 50 pages—with the cross examination and whatever comments Mr. Carlsen made at that time.

The Court: All right.

542 Deposition of GEORGE P. CASTNER

"Cross Examination by Mr. Ooms.

XQ1. Mr. Castner, this morning you were referring to the advertising by you, customers and licensees of the various features of their washing machines. As a matter of fact each of the licensees that you have issued thus far except the one to Dexter, which was never used, licensed the company under a number of Beam patents, didn't it?

A. That's right.

XQ2. And they actually covered several things besides snubber, the fluid drive and the sediment trap. Isn't that correct?

A. Yes, sir.

XQ3. Can you name for us some of the other subjects that are covered by those patents which are listed in your patents?

A. There was what we called a way-fill. That is a later patent that came along in, I think, 1953 or 1954 and it is being used, as far as I know, in the form we developed it, or covered it in any patent applications by none of them.

XQ4. Is that the Roth patent on water control level?

543 A. Yes. To my knowledge that is not being used by Speed Queen or Hotpoint. Easy has such a device and in a different form and actually it turned out that our application did not cover the way we were using it and the Beam Company are actually paying Easy a royalty for the use of that way-fill feature.

XQ5. But the Beam Company is using it?

A. It's using it on a royalty basis under an agreement with Easy.

(XQ6 omitted in numbering.)

XQ7. Now, are you paying royalties on any of these washing machines features to anybody besides Easy?

A. At this time, or at the time that I left, we were not. For a period in 1954, when we first came out with that water balance we were paying Apex a royalty of fifty cents on that feature, but there was some question about how clean their patent was in view of a patent issued through the automatic washer of Newton and we abandoned it.

XQ8. Did you abandon the license or the—that particular feature of your structure?

544 A. No. We abandoned—we abandoned the feature of that construction and went to an entirely different form as to that. We were in no manner in conflict

with either Apex or the automatic washer company's structure.

XQ9. And that was a feature in which you use water in the spinning tub to help stabilize it?

A. That is correct.

XQ10. That is not only the water which does the washing but a part of it is diverted to the balancing ring at the top. Is that correct?

A. That is correct.

XQ11. And you have a patent on that also, do you not?

A. We have filed one but we don't expect too much of it and when that Apex or when that automatic washer patent was issued in January, I think it is, of 1955, we immediately notified those licensees to lay off the thing. If they were going to do anything there was going to be a possibility of conflict with those two structures. We thought it was in the clear at first, that Apex had a clean title. We paid them fifty cents for the use of it but the meat of that structure was a series of baffles around that chan-
545 nel that collected the discharge water and we went to a heavier channel and eliminated any baffles so we lost the basic feature as covered in both of those patents, patent structures, which might have been in conflict.

XQ12. I notice in the Easy license that you have listed there, an application filed in your name in July, 1952, on a balance ring. Is that the liquid balance ring?

A. No, sir. That is not. I am pretty sure that that covered that tub structure where the top was rounded toward the center in the so-called battleneck type wherein we put those balance weights on the inside of the tub so they acted as the balance weight as well as a clothes guard to prevent the clothes from coming up and, as I recall it, we

abandoned that application, or nothing ever came of it. In fact, the use of that design has been abandoned by Beam and I know Hotpoint, Speed Queen, never used it, and I think Easy has also abandoned it.

XQ13. And Beam is not using it?

A. No, sir.

XQ14. Now I note also there is another application in the name of a man, Abell, for a hinged vane for
546 fluid drive. Are you using that in the Beam machines?

A. No, sir, we are not. And I am pretty sure that is an abandoned patent in lieu of a patent that was issued to Jack Sharp, now president of Hotpoint, former Chief Engineer. He got in ahead of us. In other words, as a licensee we had no right to do anything that they invented as improvements on our devices and Jack Sharp beat us to the punch on the development of that refinement in the fluid drive.

XQ15. Do you know whether Hotpoint is using it?

A. I do not know.

XQ16. Then you have here a snubber means in an application of yours filed in 1951. Now that is being used both by Beam and all of its licensees, isn't it?

A. No, sir. That we considered a modification or possibly a slight improvement over our original snubber means. Hotpoint did not change to that. I think they are, as far as I know, the last machines that I saw of theirs, they were continuing exactly with the same design as our original snubber means. That device was at the time of the
547 Speed Queen license, was disclosed to them as a refinement on the original snubber means but they elected to follow the original snubber design exactly as Hotpoint was using it. Easy, I think, went to that modification of the snubber mounting.

XQ17. Now the original structure design which you refer to as having been improved in this application of yours of '51 was something you had designed and put on the original commercial Beam machine?

A. That's correct.

XQ18. And that is covered by one of your earlier patents?

A. That's right.

XQ19. And that snubber means is still used not only on all of the Beam automatic machines but on the machines of Hotpoint, Easy and Speed Queen, isn't it?

A. Wait a minute now. You are talking about the original snubber?

XQ20. Yes, but Easy may have added the improvement but they are all using the basic snubber?

A. That's correct.

XQ21. Was that covered by the Castner, or the
548 Castner and Lund patent? I notice you have three patents issued in 1950 which are not for the sediment trap; two of them to you and one to Castner and Lund.

A. Do you have copies of those patents?

Mr. Carlsen: No, I do not.

XQ22. I think we can check with the originals, but it is one of those, isn't it?

A. Yes. That's right.

XQ23. Now, which of the patents (and I only care for identification by name) covers the fluid drive? Is that one of the early Castner patents, also?

A. That is. Yes. The patent office had us divide that from the original washing machine and carry it as a separate application and now several of the subsequent patents have to do with modifications and what we considered improvements on the fluid drive but there must be at least

seven or eight of those fluid drive patents that were either issued or are in the patent office yet.

XQ24. And, that fluid drive, upon which you have patent applications or patents was incorporated in the original Beam commercial machine?

549 A. Yes.

XQ25. And you are still using it on the Beam commercial machines?

A. Yes, sir.

XQ26. Are any of the three licensees, Hotpoint, Easy or Speed Queen, using it?

A. They are all using the fluid drive as far as I know and also, as far as I know Easy and Speed Queen are using it one hundred per cent. Now the only thing that I have to the contrary on that is that on one model Hotpoint had a slip clutch on that. By that I mean a friction clutch rather than a hydraulic clutch or a fluid drive. But that's the only deviation I know, is on one cheap model that Hotpoint had it on.

XQ27. Was that their own design or something they procured from Beam?

A. That was independent of ours. That was their design.

XQ28. Now, I note in your license you listed also an application filed in '47 in your name on a drive mechanism. Is that part of the fluid drive system?

A. No. Well, it might have incorporated the fluid
550 drive in a different form. It seems to me that that covered one where we had mounted a fluid drive around the center post and it required several belts and that was one that never got into production by us or no one else, to my knowledge.

XQ29. Well, I am correct in this, am I not, that each

of the licenses you issued, except the one to Dexter which was never used, not only permitted the licensee to use any of the listed patented inventions or those covered by pending applications, but also to use any subsequent inventions that the Beam Company made?

A. That is correct. Any refinements at least, that came in. I am not sure that it covers all of them. We could determine that from it.

XQ30. Well, I just have before me the Easy Washing Machine license and it says that whenever the licensor acquires or controls or becomes entitled to grant licenses under any other letters patent or applications in addition to those listed for improvement on any of the inventions covered by the claims of the patents and applications listed, it will disclose those and the licensee shall have the right upon election to use those without any further royalty.

551

A. That is correct. Its improvements. That is the question that is bothering me. In other words, if we came up with something entirely different, they would have no right to it unless we made a decision to give it to them but the license agreement says they are to provide for improvements on that structure.

XQ31. Well now, you mentioned this morning that you had a rather good sized laboratory and research department at Beam and I assume they are working on washing machine problems. That's your only product, isn't it?

A. That's right. And dryers.

XQ32. And dryers?

A. Yes.

XQ33. And to the extent that they develop anything which is an improvement upon that basic machine covered by the listed patents and applications the benefit of those improvements goes to your licensees?

A. Yes. That's correct. If there is any improvements on the sediment trap, they would be entitled to that.

552 There was one that we thought was quite an improvement on another line of development. That was a clutch or modified design of the clutch which eliminated the use of one solenoid and save about a dollar. However, it wound up that it had so many intricate parts and it wasn't a complete assembly that Beam killed the thing off and told the boys we weren't going to spend any more time on it because of the problem of servicing it in the field, and, as far as I know that was never adopted by any of our licensees. I don't think they ever had a formal turndown by Easy or Speed Queen, but I know that Hotpoint definitely turned it down. They turned it down in writing.

XQ34. That was offered to them a part of the package which was included in your license?

A. Yes. As improvements on the original three basic ideas.

XQ35. Now, did the Beam Company ever make any parts for any of the licensees, Hotpoint, Easy or Speed Queen?

A. To my knowledge we have never contracted with any of the licensees to supply any parts to them that

553 might be made in our shop. I think on possibly one or two occasions, there wouldn't be more than that, that Hotpoint came to us in distress of where a supplier had let them down and that we, I think, cut the teeth on a few gears or something like that, but we never agreed or contracted to supply any parts. In the case of Hotpoint, we did agree to permit them to use excess capacity on tools in outside shops that we purchased parts from, providing it in no way interfered with our production and provided further that the supplier elected to supply them and I know

of several instances of where the supplier said no, they don't want to have anything to do with a big company like that, that it would be just temporary and they turned them down.

XQ36. But in some cases Hotpoint did get parts made from your tools?

A. From outside shops, yes, sir.

XQ37. Do you know what parts, particularly, they were able to procure in that way?

A. For a very limited time they did get some tub parts from Alliance Ware at Alliance, Ohio. That was on their original machine for the splash tub cabinet and for
554 the spin tub; I know that developed into a very unsatisfactory deal for both Hotpoint and Alliance because Alliance felt that they sent their man in there to get information to get set up to have them produced elsewhere. Incidentally, with the Ingersoll Steel Division of Borg-Warner. And they rushed right into that and so it was just for a very limited time that they got those parts from Alliance.

XQ38. Didn't one of your other licensees get some parts from Alliance, either Easy or Speed Queen?

A. Yes, Easy did, and I think they still are, and they committed themselves to us for a substantial sum of money for the use of those dies. I think they paid us $25,000 at the time of signing the agreement and committed for an additional $25,000 or an overall sum of $50,000.

XQ39. That was to take care of amortization of the tool cost?

A. That's right. In view of the investment that we had in those.

XQ40. Are they still, when they have the tubs made at Alliance, having them made by your tools?

555 A. I don't know that Easy are having any made

at Alliance. They did wind up, however, making their own dies and I think, today, that they have completely worked out of any use of our dies directly.

XQ41. Did Speed Queen ever take advantage of that arrangement to have tub parts made by any of your suppliers?

A. We never had any regular arrangement. It would have to be a specific situation. And in case of Speed Queen, I think they used one part of a pump and one part of the fluid drive from our sources for a very short time and they made us a unit cost for that. As I recall, it was five or ten cents for each of those units per piece that they got from the source of supply.

XQ42. Is Speed Queen the only licensee that had parts of the fluid drive made by your suppliers?

A. I think that's all that had any parts, and like I mentioned, it was just a very few.

XQ43. I note also that in some of these licenses, Mr. Castner, there was a provision for the licensee getting designs, drawings, designed for and technical help from you; Easy, by means of a separate technical assistance
556 agreement and I think Hotpoint by the original agreement, and I think Speed Queen by a provision in the original agreement. Do you recall that the agreements contained such provision, Mr. Castner?

A. Yes, to the extent that we were disclosing to them how those parts could be made. In the case of Easy, they paid us $25,000.00 at the time of signing the agreement for such technical help and it consisted primarily of a set of our drawings and an inspection of the plant at reasonable times so that they could see what processing we were going through. Actually, it did not amount to too much for this reason, that we were not what they term a fully inte-

grated manufacturing operation. We made certain parts but we did not go into that as thoroughly as I think any of the other bigger manufacturers in the industry. We never made our tubs. We, even our transmissions though we spoke of making them we cut the gears but we didn't make the gear blanks. We bought those. We didn't make the tubs that were pressed into the casting. There's five or six of those. There is a very simple screw machine part but we had no screw machine facilities so that there
557 wasn't anything in there that we could offer them. So, it really dressed down to getting a set of drawings and then if they wanted to duplicate these parts they could.

Now, Easy elected that they wanted to get whatever help we could give them in that direction and we collected $25,000.00. In the case of Speed Queen—

XQ44. (interrupting) Let's stay with Easy a minute, if it is agreeable, Mr. Castner.

A. All right.

XQ45. On that Easy operation they sent people out to Webster City to see your assembly line, didn't they?

A. That is correct, sir.

XQ46. And that $25,000.00 that they paid you was amortized at fifty cents a tub when they began getting tubs made by Alliance from your tools?

A. There were two $25,000.00 payments in the case of Easy. One for engineering help, their technical assistance. The other $25,000.00 was an advance payment to apply against the $50,000.00 minimum for the use of the dies on the tub.

XQ47. Well, did they pay you $25,000.00 or $50,000.00 upon execution of the agreement?

558 A. They paid us $25,000.00 for technical assistance. They paid us $25,000.00 for that arrange-

ment on the tubs. They paid us $15,000.00 as a down payment on the license agreement. And I think there were some other payments that they made, but I think they had at least $60,000.00 right on the line at the signing of those agreements covering the license, technical assistance and the use of the tubs.

XQ48. Well, that's all, as covered in these two agreements?

A. That's correct.

XQ49. And all the payments are recited in there for the purposes they were made?

A. Yes, sir.

XQ50. Now, they did, at the time you made the license with Easy in October, '52, they had a washing machine of their own design, did they not?

A. Yes, sir.

XQ51. And they discarded that and made one that was basically the same as the Beam?

A. Yes, sir.

XQ52. Many of the parts are interchangeable?

559 A. Up to a certain point. They used, for instance, an entirely different dimension for the base. In fact, they used a base that was designed for their own machine. Now that changed the dimensions and it changed parts that fitted to that base so that it made, or introduced, quite a number of structural details that varied from our machine. I think the main things that were similar were the tubs and the transmission and the fluid drive, possibly the pump.

XQ53. What about the snubbers?

A. The snubbers were of a similar design but were not identical or interchangeable because their base came up different and they would have to modify it.

XQ54. When you speak of the transmission, that is something other than merely the fluid drive?

A. Yes. That is the transmission that contains the gears and the fluid drive, when I have talked about that in the transmission, I generally modify it that the fluid drive, as related to the transmission, really, the fluid drive normally functions between the geared transmission and the
560 oscillating pin shaft of the washer so as to cushion between that.

XQ55. Now that transmission which Easy uses was of your design?

A. Yes, sir.

XQ56. Are they continuing to use that, do you know?

A. As far as I know they are continuing with that.

XQ57. Well now, you were about to speak of Speed Queen and their relations with Beam insofar as this question of technical assistance was concerned. Did they take advantage of it?

A. No, not beyond getting the drawings, and they sent a couple of their men out to the plant on two or three occasions to see what they could get in observing the production functions, the type of equipment and so on, when we were doing certain parts. They deviated from our design. It might have looked similar, but they had their own geared transmission which was of different dimensions and they really engineered their whole design all the way through. There was hardly anything that was interchangeable other than a few parts on the fluid drive and the pump. Even their tub was different and all.

561 XQ58. Did they use the snubber arrangement that you had developed at Beam?

A. Yes. They used that first design and I think they still are. They used a design similar to what Hotpoint used which was exactly what we used when we got started.

XQ59. Now did Hotpoint ever take advantage of the technical assistance provision of their agreement?

A. They did at the start, and they were supplied with drawings and also they had a couple of men out there. At least Jack Sharp, himself, was out there shortly after they signed up the agreement.

XQ60. At the time that you licensed them in '48, they had a washing machine, had they not?

A. Speed Queen?

XQ61. Hotpoint.

A. Hotpoint had been selling washing machines because of their being a fully owned subsidiary of General Electric. They were getting the wringer type washers and they were produced by General Electric in their Eastern plant. I think at Bridgeport.

XQ62. But they had no automatic?

562 A. They might have even had some of the General Electric automatics but my impression was that they did not have an automatic.

XQ63. And when they put out the automatic in 1948 or '49 they made one that was structurally, fundamentally the same as the Beam machine, didn't they?

A. Yes, sir.

XQ64. And they continued that for several years?

A. Well, until I think for about eighteen months because they told us they were putting their men to work immediately, at the time they signed the license agreement, to redesign the whole thing, and which they did. They came out with an entirely different type of cabinet and they incorporated a different gear transmission and the features of their fluid drive were changed, the method of clutching it. They did stick to our old original design of snubbers only I think they put three on instead of four like we had

originally. But I don't think there were any parts interchangeable on their redesign of the machine except possibly the spin tub—no, that wasn't interchangeable, either.

563 So that they completely worked away from our design.

XQ65. But they did still incorporate your design? That is not in structural detail but your design of snubbers and fluid drive?

A. Fluid drive and sediment traps.

XQ66. Well, did you—beg pardon.

A. In their redesign they had the sediment trap in there just like basically the same as what we had with the tube on and everything.

XQ67. And they have continued with some interruptions to use and not use that sediment trap from time to time, haven't they?

A. To what extent I have never been able to find out from them.

XQ68. Well, when you picked up this circular put into evidence this morning as Plaintiff's Exhibit 38, did you see a Hotpoint machine at a contractor's place of business?

A. Oh, no. No, he never had any samples of anything there. I didn't see any more washer than I did the oven and dishwasher that I bought.

XQ69. You did see one as recently as January, 1955, did you not, at the furniture show in Chicago?

A. Yes. Yes, I looked at one machine over there.

564 I always feel a little guilty going to those places. These salesmen gang up on you. But I did slip the agitator off and I did not see the standard conventional sediment trap as they had started out to use it and as we have used it. They had some kind of an irregular shape in there. I couldn't quite figure it out.

XQ70. And they had no discharge tube on it, as I recall.

A. I could not tell. See, you would have to take the cabinet off to see that. They had some kind of an outlet on it. It seemed to me it was a rubber connection which I couldn't figure out and we never bothered to go out and try to pick up a machine in the field to see and we knew it was out of the question to try and go to them to get the information because they just weren't telling us what they were doing.

XQ71. Well, they have to send you a quarterly royalty report, don't they?

A. Yes. That's all we would ever get from them.

XQ72. Have you ever undertaken to check the royalty report against their books?

565 A. No. No, we have the privilege, I think, of sending a certified accountant in there and we have never disputed the figures that they gave us because they appeared to be in line with what activity the industry was enjoying and what activity we understood from suppliers. You get some idea of what they had.

XQ73. Whenever they paid you royalties, they paid you the full rate of one per cent, subject to such quantity reductions as the license provides, haven't they?

A. Yes, sir.

XQ74. In other words, they were paying on at least two of your features?

A. Yes, sir.

XQ75. And as far as you know, on every machine on which they paid you royalty they had both the snubber and the fluid drive?

A. That is not correct. I do know they didn't have the fluid drive on at least that one model that I observed.

XQ76. You don't know whether they paid you royalty on that one or not?

566 A. No. Not down to exact details. But we know that their volume was substantial, and within what estimates we would have. For instance, like this year, they paid somewhere around a hundred and a quarter on that sliding low rate. At 6% it figures out about eighty-five or ninety cents a machine, which would mean that they turned out somewhere around one hundred forty or one hundred fifty thousand machines. At least that's what they paid us for.

XQ77. Well, you didn't give us any figures yesterday on 1955 production by your licensees, did you?

A. No, sir, I didn't have that.

XQ78. All of those royalty reports are at Webster City?

A. They are now at Gamble-Skogmo in Minneapolis. Since Gamble-Skogmo sold the Beam Company in July, see, Gamble have the assignment of those patents from Solar.

XQ79. But they are kept as permanent records of the company?

A. Oh, yes.

XQ80. And do you recall in what form those royalty reports were? What detail they had other than the

567 number of machines and the amount of royalty transmitted?

A. Yes. It's just in units and at the average billing price resulting in so much in dollars. Now they only showed that much and they have been taking the full one per cent or its sliding scale reduction. They have never in the case of Hotpoint, or any of them, made a report indicating that they were paying the half rate which would prevail in the event of using only one of those three basic features.

XQ81. In other words, as I understand you, there is

no licensee under this license who is using all the things licensed, merely the sediment trap?

A. That's correct, there are none.

XQ82. And except for the license you once issued to Dexter which gave them an option to take a license under the sediment trap patents, alone, you have never issued a license under the sediment trap patents alone?

A. We have never issued a license other than Dexter for one feature and that was an option deal. They
568 waived it as to just what feature it was going to be. It originally looked like the fluid drive and then they delayed such a long time and it looked like they were going to have their own machine and that they would want the sediment trap. But it finally slivered out and they never used any of those. In fact, they were bought out by Philco.

XQ83. And all the machines that they have sold which incorporated a sediment trap were built by Beam?

A. Offhand, I was going to say that I didn't know that they had any with the tube on them. They all had the sediment trap.

XQ84. If they leave the tube off, that doesn't come within your patent, does it?

A. That's right. But that was not a point of discussion at all when we were selling them. They were hurting for automatic washers. We didn't care too much whether we sold them because they intended to make their own in another six months or so and we didn't want them to conflict with our other customers in the field and I know that we purposely withheld the tube off of those first machines that we sold them. Now, whether or not they are getting
569 it with the tube on now because they are still buying some—they never got into production and neither has Philco, that bought them out.

XQ85. And it is three years ago that you had that agreement with them, isn't it?

A. Yes, sir. It is just about that time. I don't remember the exact date.

XQ86. And you have been selling them machines for the last three years?

A. Yes. We have been selling them not on any firm obligated basis like we have handled other customers. We take, on the Firestone, for instance, we try to see them through in periods of scarcity. We give them a fair allocation of our production. I am thinking of your war restrictions, and so on, or when things have been coming. In the case of Dexter or Philco, we have told them we will supply them providing we can get to it and after we have taken care of our other customers. In other words, it is almost like a surplus deal.

XQ87. Do you supply them with more than one model of washing machine?

570 A. Up to the time that I left I think that we had never given them over one model.

XQ88. And how many different models does Beam make and when I say that, I mean basically different, not in cabinet work and trim?

A. That has varied as the competitive situation has got tougher. Up to 1953 I think we had only the one basic model that was supplied to all of them. Then as this competitive situation got tougher and there were lower prices being advertised they all felt they needed a cheaper machine and then we brought that in and I think today that most of them have about three models in their line; the low price, the medium and then the de luxe model.

XQ89. And all of those sell from the factory at over $100.00, don't they?

A. Yes, sir.

XQ90. Do all three, if you are correct in assuming that there are three, do all three models have the snubbers and the fluid drive and a sediment trap, whether it is tubed out or not?

A. Yes, sir.

XQ91. And the difference in the three models, then, insofar as these features you have been discussing are concerned, depends upon whether or not you have opened the discharge and put a tube on the sediment trap?

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A. That is only one of the details in which it might vary. The tops on some of them are porcelain. On others they are painted.

XQ92. I was confining myself, Mr. Castner, to those basic features.

A. To the mechanism? Yes. I think that is about right that the mechanism and the base are all pretty much the same.

XQ93. You modified, as I understand it, the controls, the cabinets, the trim and then the finish of some of the parts where you have the higher priced line?

A. Yes, sir.

XQ94. Now, the machine you sell Philco, is that the same as the one you sell Dexter? Or, has Philco completely taken the place of Dexter in the picture?

A. They have in this respect: in that they are the parent company. The arrangements are still made with the Dexter Company, a division of Philco.

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XQ95. And do you sell Philco more than one model or is it just the single model?

A. Up to the time that I left it was just one model. That is, it would be one model during the course of the

year. Then, in the next year might be just a little different.

XQ96. Do you know whether that is on your high priced end of the line or the low priced end of the line?

A. Generally it would be on a middle or be about a medium or middle model. They were always hurt for profit margins because it really amounted to a distributor on top of a distributor when they presumably were manufacturers buying from another manufacturer.

XQ97. This morning, Mr. Castner, you referred to several advertisements and Plaintiff's Exhibit 34 and pointed out what features were advertised by your various customers and licensees.

Now, referring to section one you mentioned that the sediment trap and the fluid drive were emphasized in that circular. Now, I call your attention to the cup directly to the left of the fluid drive under the heading
573 'spinner tub' and the sentence in the text which says 'this feature together with a series of vibration eliminators contributes to its smooth, quiet, performance.' That is a reference to the snubbers, is it not?

A. Yes. That would be, and it is my recollection that I stated that that circular contained all three features. It should have been that.

XQ98. Perhaps you did, Mr. Castner, but I merely wanted to point out in there that in addition to the fluid drive and sediment trap the snubbers although by a different name are referred to?

A. That's right, yes, that would definitely take in the three features, that one, and I think on that one I referred to the fact that they featured the three items.

XQ99. Now, referring to this circular, there are a number of features emphasized. The smooth-finished tub and the something called the solenoid and the fact that the

machine requires no bolting down. Those features were all incorporated in the design which Beam developed, weren't they?

A. That is correct. However, they weren't patented
574 features and they were the novel things you would find. You would just about have to have in a washer, whereas these others were different than you find in the average washer.

XQ100. The features of the snubbers and the fluid drive refer to a rather complex and technical part of the mechanism, do they not?

A. Yes. They are a basic part of the mechanism.

XQ101. And when you prepare this sales material for the housewife who is to select the machine you usually put a great deal of emphasis on the things she recognizes and is familiar with, do you not?

A. We never go into that advertising. This is all prepared by the Gamble organization. We did not have an advertising department as such, ourselves. But in answer to your statement, though, I think that would be generally true, the things that would appeal, and of utility and merit.

XQ102. And that were understood by the housewife?

A. Yes.

XQ103. You don't happen to have a copy of that single circular that Beam prepared at one time, do you?

A. I think I stuck some of them away just to have
575 a copy of them. I don't have them in this assortment here. I may be able to, if you want to take a break.

(At this point the hearing was recessed for a short time, after which the following procedures were had:)

XQ104. Mr. Castner, when you returned you said you had been unable to find a circular of the issue that Beam put out. Might there be such at the factory at Webster City?

A. They were never used. I got the idea, I guess it wasn't much over a year ago, about the first of January last year, that we might go out with a Beam line and I worked with a fellow who was retiring and he has since gone to Norge, Jim Ogden. He thought he could go out and sell distributors and I had those made up and they were never distributed and we never got in. We spent $1500.00 or something like that for a special name plate die and those circulars. There weren't too many of them but I don't know if even anyone there in the sales promotion department would have any. I could check, though.

XQ105. I am going to leave a request with Mr.
476 . Carlsen for several requests at the end and I think that is one I would like to have located if they have one because that is something that the Beam Company, itself, did at one time prepare in connection with the machine.

Going back to this pamphlet, Plaintiff's Exhibit 34, in section 2 you referred this morning to the fact that there were three features emphasized in that circular; the drive, the floating power and the dirt dispenser?

A. Yes, sir.

XQ106. Now the circular also emphasizes the solid tub, the top loading feature of the washer, the reduced use of hot water, the dial controls, the agitator and the signal for the end of the cycle. That is correct, is it not?

A. Yes. Those, beyond the four, are not emphasized as much as those four items, however.

XQ107. Well, in one area on the circular they have about five items and in another area they have four and the areas are about the same size, aren't they?

A. Yes. Except with the five that are smaller, there
577 is also other copy about identical twins and their leisure time.

XQ108. Well now, Mr. Castner, turning to 6 and 3 of Plaintiff's Exhibit 34, you have that advertisement divided into almost halves and four features shown in each, do you not?

A. Yes, sir.

XQ109. And there is quite a bit of text by the fluid drive?

A. Yes, sir.

XQ110. Well, the circular speaks for itself as to the others but you will agree with me that in all they emphasize about eight different features of the machine?

A. Yes, sir.

XQ111. We come to section 4 of Plaintiff's Exhibit 34, and that is a circular of instructions to the housewife on the use and care of the machine?

A. That's basically a folder for laundry technique and washing.

XQ112. The housewife is not expected to service any of the mechanism, such as the fluid drive or the snubbers, is she?

A. No. She wouldn't.

XQ113. In fact, they are inaccessible to her?

578 A. She normally would n't come in contact with them.

XQ114. Now I note that in that circular they describe apparently two different models; the Wizzard and a standard model on pages 2 to 5, I believe. Am I correct in that?

A. It looks like they are all on page 6 and 7. At least they portray three models at the top of page 6.

XQ115. Did you know whether all of those had sediment traps with the tube discharge?

A. I think from the pictures portrayed that, and read-

ing that copy under 'self-cleaning sediment trap', it looks like it was the de luxe model that was fully equipped with not only the sediment trap but the tube and that the other two might not have had a tube on them.

XQ116. Did you make all three models for Western Auto Supply?

A. Yes.

XQ117. And do you recall whether the lower priced models, the master and standard, had sediment traps on them?

579 A. The master and standard? I am sure the standard, the round one, did not have it on. That was a bad misjudgment of the market and that machine we came out with, about five years too late. They thought they would use some and because it was a lower cost machine, but it never took because it was round and I think that was featured because they were trying to unload them and it was carried over from the year before so that that was strictly an interim hot-shot deal which did not click. And their lines, they would probably have considered it as consisting of the two square models on the right and the other is a clean-up.

XQ118. Did the lower priced square models have the sediment trap?

A. Yes. But I don't think it had the tube.

XQ119. Would your production figures at Webster City show the numbers of each type made with respect to whether or not the sediment trap had a tube discharge?

A. Well, normally the engineering records would carry the specifications of each model and it was from that record and those specifications that that data was com-

580 piled that I gave you on the Beam production where we had a breakdown of those with the tubes and without.

XQ120. Those figures that you had projected for the last three quarters of '55 should be complete on the record at this time, shouldn't they?

A. Yes. They should be complete.

XQ121. And the first quarter of 1956 ought to be in condition also, shouldn't it?

A. It would be. I don't know how convenient it would be. Ordinarily they drag quite a bit. It would be there, that's right. Now how much a problem it would be, I don't know, because the Beam Company, as it is today, is no longer interested in these things, in going out of their way to compile a lot of data over which they have no further interest because they are a licensee today. They are paying Gamble a royalty.

XQ122. The present Beam Company?

A. That's right.

XQ123. But weren't most of the control data taken from Webster City to the Gamble-Skogmo headquarters?

A. I don't think it was ever done.

581 XQ124. Well, as I understand it, all of the licensees who are now paying royalties are paying it to Gamble-Skogmo, not to Beam?

A. That's right.

XQ125. And Beam Manufacturing Company, organized in 1955, stands in the same position with respect to the parent company and pays the royalties?

A. That's right. Incidentally, in that connection, there is no longer any technical assistance available to any licensee by the Gamble-Skogmo Company and the owners of the license.

XQ126. Who is conducting the research laboratory now; just the manufacturing company?

A. That's right. The new company.

XQ127. And only for its own benefit?

A. Only for its own benefit is correct. So there is absolutely no obligations on the part of the new Beam Company to tell Easy or Speed Queen or Hotpoint anything, or to supply them with any help or information.

XQ128. Is the Beam Manufacturing Corporation (I think the name is) the one organized last year, a wholly owned subsidiary of Gamble-Skogmo?

A. No. No, that is a wholly owned subsidiary of the Franklin Manufacturing Company of Minneapolis.

582 Their office is in Minneapolis. And they have a factory up in St. Cloud?

XQ129. The manufacturing subsidiary is no longer in Gamble-Skogmo. Is that correct?

A. That is correct. And the same with any patents that the new Beam Company files or honors since July 1st. Gamble-Skogmo has nothing to do with that and so that there is a complete division there.

XQ130. Well, Mr. Castner, look at section 5 which you described this morning as the automatic washer of Associated Merchandising Company, or Corporation?

A. Corporation.

XQ131. I think you said that only the sediment trap and transmission or fluid drive were emphasized. That is correct, is it not?

A. Yes. Out of those three basic features.

XQ132. But there are several other features about filling and the agitator and the control that are also emphasized, aren't they?

A. That's right. I was pointing out those three basic features that we felt were the ones that were incorporated in our license agreement.

583 XQ133. And in the last paragraph at the foot of the page, referring to the Champion model as dis-

tinguished from the Super De Luxe, refers to the easy-to-clean sediment trap although there is no tube on that particular sediment trap. Is that not correct?

A. I think that's what that terminology is describing. No tube, but, the sediment trap. See, in the deluxe machine above, they say, 'automatic self-cleaning through spiral tube.'

XQ134. And then if you look at the back page of the next section, Section 9, you find that there is reference to the sediment trap and to the fluid drive although that sediment trap has no discharge tube. Is that not correct?

A. Yes, sir. That's right.

XQ135. I notice also that in referring to the fluid drive the text of the circular reads, 'but assures quiet vibration-free operation.'

Now, insofar as that operation is vibration-free, part of that is due to the snubber rather than the fluid drive, isn't it?

A. Well, at least the snubber would enter into that.

584 The fluid drive slows down if the load gets severely out of balance or anything and that is what the thought was back of that, but it would also supplement the action of the snubbers but I don't think it would be recognized by the average person as having anything to do with snubbing.

XQ136. Well, without the snubbers you couldn't work one of these machines, could you?

A. That's right.

XQ137. The load would become unbalanced and the machine would vibrate to the point where you would have to have an automatic cutout to shut off the power, wouldn't it?

A. Yes. One supplements the other.

XQ138. The same comments that I made about section 6 in this Exhibit 34 are also applicable to section 7, except there you have a tube to discharge the sediment. Is that not correct?

A. That's right. So it distinguishes between the two.

Incidentally, where I said I thought these accounts all had three machines, it is very evident here that at least in 1955 that Firestone had the two models and AM'C had the two models rather than three.

585 XQ139. And Wizzard had three? Western Auto Supply?

A. And Coronada had three, I know.

XQ140. Those were your principal outlets?

A. That's correct.

XQ141. Now is it not also correct, Mr. Castner, that until 1954 you did not produce for any of those outlets a machine that had no tube connected to the sediment trap?

A. 1954? There might have been some in 1953. Just let me refer to that production now—yes. 1953. Those were the first ones without tubes.

XQ142. For whom did you make them in 1953?

A. That is not broken down. Your question referred to '54, did it not? But there were 6,000 in .953.

XQ143. Do you have the totals by years of those without tubes?

A. Yes. There were 6,068 in 1953; there were 8,221 in 1954.

XQ144. Do you have the figure for '55?

A. No. I had the actual figures. The production was up in the first three quarters of '55 and there was

586 3,239 to which (and the figures I gave you) I added 7,500. So my guess would be that there is about 10,750 in 1955.

XQ145. Didn't your production climb throughout that year?

A. Yes. Yes, it did.

XQ146. Isn't 7,500 a little low for the last three quarters?

A. No. That's the same ratio as prevailed and where there were 11,000 produced in the first three months I estimated 31,000 in the last three months.

XQ147. How many did you produce in the first three months?

A. 11,020.

XQ148. That was the total?

A. Yes, sir.

XQ149. Did you compute out the per cent?

A. The percentage on that is about—it is less than 30%. Thirty-two-thirty-nine—would be about 20.

XQ150. Just a little less than thirty, isn't it?

A. Yes. About 29%.

XQ151. I get 29.4.

587 Let us return to Plaintiff's Exhibit 34, and dispose of it. The next section you have there is Section 9 in which you pointed out this morning that the sediment trap and the fluid drive were both referred to but they are only listed among the total of fourteen points, aren't they?

A. That's right. I think I referred to Item 12 as sediment trap.

XQ152. And then if we go to section 10, which is an advertisement of Speed Queen, you pointed out this morning that the fluid drive was shown and the automatic sediment ejector was shown at the bottom of the page. Those are two of the six cuts in that group, aren't they?

A. Yes, sir.

XQ153. Now, there is a license there to a famous Arc-

cuate dry transmission. Was that one of the features that you turned over to Speed Queen?

A. No. That is a transmission that is similar to ours but that is a long story. The patch transmission we are talking about he developed up there at Speed Queen in Rippon and when he went to work, though, there was an understanding they would own anything that he had patented but they would have a shop right. I came along and

588 I made this exclusive license agreement on that transmission for Beam subject to the shop right of Speed Queen and that's when Norge came along then and I think he arranged so that he had the use of that transmission and so that that is really something that was developed way back, I think in 1934 or '35.

XQ154. It was, however, whether or not in the precise detail of this Speed Queen model, it was something that you were also building into the Beam machine?

A. A version of it. Yes. There was nothing interchangeable. We had a lot of differences but we had that link that was similar, the patented feature.

XQ155. Turn now to Section 11, Mr. Castner, and I believe you pointed out that by separate cuts on the first page of this circular the fluid drive and the sediment rejector was shown. In the listing of features in the cut-a-way view of the machine on the next page they also list the balance ring and the snubbers and about a dozen other features, do they not?

589 A. I didn't see—oh, yes; they do have snubbers there, but that is pointing to where they are trying to cover everything that they can just about point to. It isn't what I would consider those arrows as being special features such as they have emphasized with separate cuts on the balance of the folder.

XQ156. Well, on the back page of that circular, Section 11, which bears the name 'Easy Washing Machine Corporation', they have about two columns which are entitled 'features'?

A. Yes.

XQ157. And in there under fluid power they discuss not only the fluid drive but also the snubbers, do they not?

A. Yes, sir.

XQ158. And I think on number 12 you said that the—

A. (interrupting) Yes. That's right. So that I overlooked that and when I was making reference to our three basic features and said there were two in that circular that would really mean that there are three out of the three shown there.

XQ159. And in the circular which is in Section 12, of Plaintiff's Exhibit 34, there are cuts of the fluid drive and also of the sediment rejector, aren't there?

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A. Yes, sir.

XQ160. And that there are a number of other cuts on spin drying and hot water savings and thorough-power rinse, and also of the master-mind dial. Do we agree on that?

A. Yes, sir.

XQ161. But over at the left where they listed directly under the picture of the machine a number of its features at the bottom of column 2, they refer to 'free floating mechanism. Snubbers dissipate vibration'. 'Rubber cushioned drive unit eliminates washer bolt-down'. Do you see that?

A. Yes, I do. And my statement should have included that but I overlooked it because it is not prominent and supplemented with a photograph like the other two features were.

XQ162. Now this Norge. You said that you had heard of the Norge machine, or had seen some notice of it in the summer of 1951 and had written to Mr. Ardis asking that he send you and bill you for a specimen machine.

That was the common courtesy which you manu-
591 facturers extended to each other. Isn't that correct?

A. Yes. We could always go out and buy one on the open market but we would all get stuck for a retail price. This way we got them presumably at the low-down cost.

XQ163. Well, it is a highly competitive field, isn't it?

A. Yes.

XQ164. And in a highly competitive business you would not only be compelled, but have the privilege of seeing everything your competitors make, don't you?

A. You normally do.

XQ165. Well, you have checked the efficiency of one against the other? You always have several competing machines in your laboratory, for examination, do you not?

A. That's right. And particularly if there is anything new. Ordinarily, we get the first model and then maybe observe some things or read the advertising copy and it isn't very often that you bother to get the second machine unless it is completely new, a rebuilt design.

XQ166. But unless you can build as good a ma-
592 chine or a little better than those of your competitors in the minds of some of the customers, you just don't do business, do you?

A. That's right.

XQ168. So that there is nothing reprehensible about getting each other's machine. You agree with me on that, don't you?

A. That's right.

XQ169. Do you have any arrangements with any of your licensees to send you machines?

A. No, sir.

XQ170. Do you undertake at all to check? I mean when the old Beam Company was still alive, to check whether they were maintaining the quality standard that you people had set up in the industry?

A. No. They were on their own in that respect. We would ordinarily be glad to discuss it with them if they came to us with a problem.

XQ171. Mr. Castner, yesterday you referred, in discussing several of the machines, and especially six Norge models, to a booklet which you were kind enough to let me use overnight, entitled, 'Specification Book, Ameri-
593 can Home Laundry Manufacturers Association'. This is the current specifications sheets of the different manufacturers of automatic home appliances, isn't it?

A. They are advertising sheets and they include specifications as reduced to an advertising basis. They would not be considered engineering specifications sheets.

XQ172. Now, but they contain a few specifications of dimensions and things of that kind, do they not?

A. Yes.

XQ173. It's the kind of a pamphlet that is prepared for inclusion in the salesman's portfolio?

A. It must go beyond there. There were a hundred thousand of that one referred to that were printed according to the data right on the back of that.

XQ174. Oh, yes. I was just looking at another to see if it had any print numbers on it, but it is the kind of circular that is distributed to prospects and to salesmen and in general use by contractors and architects and anybody who has occasion to want to know dimensions and appearances of the machine, isn't it?

A. Well, on what type of a machine it is, it's really—it can be used for any one of those purposes, including customer advertising.

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XQ175. I notice that the sheet which you produced this morning, Plaintiff's Exhibit 38, has a copy in here also of the Hotpoint circular. You see that one?

A. Yes, sir.

XQ176. Now I note that in addition to that circular of Hotpoint, under push-button automatic washer they have a de luxe Hotpoint automatic washer which contains a sheet which does not show the sediment ejector. Do you know that model?

A. Model L. H. 11? No, I do not.

XQ177. That's a '56 model of Hotpoint, isn't it?

A. Yes. Yes, those are presumably all 1956 models.

XQ178. I note there a cut-a-way section of the tub, in this circular, which does not show any sediment trap or tube at all. Do you see that, Mr. Castner?

A. Yes, I do.

XQ179. And similarly, with the next sheet in this book showing the deluxe Hotpoint push-button automatic washer Model L. J. 11, there is a picture of a cut-a-way tub, but there is no showing of any sediment trap or tube. Is that not correct?

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A. Yes. That's correct.

XQ180. You are not informed as to whether these three machines of Hotpoint have your fluid drive?

A. No, sir. They do not feature it apparently in their illustrations or copy.

XQ181. Do you know whether any of the three has your number?

A. Not for sure. I don't know what they have done. The only conclusion that I had come to from the things you have pointed out is that they have appraised the sedi-

ment trap and tube as a super deluxe feature and at least they are featuring it on their top model and the other conclusion that I drew from that is that they are still paying for royalty on presumably all the machines they have produced. So that they must have either the fluid drive or the sediment trap with a tube or snubbing device. They must have at least two of those on all of their machines, would be the conclusion that I would draw from that even though they don't feature snubbers and fluid drive.

596 XQ182. Well, I thought on the circulars on their super de luxe model, L. K. 11, and their de luxe L. H. 11, that they say this about the smooth operation: 'central snubber and support absorbs vibration. Assures smoother spinning and more dependable operation.' That describes your snubber arrangement, does it not?

A. They have got it so it would be pretty difficult to identify with that wording.

XQ183. 'Central snubber and support absorbs vibration'?

A. Well, that isn't a very good technical description. It could be identified. I don't know, 'central snubber', there is a central support, a central pivot point at the bottom.

XQ184. It does have a central pivot point, does it not?

A. Well, our construction does, yes.

XQ185. They have never notified you that they discontinued the use of the snubbers, have they?

A. They have never notified us their discontinuing of anything other than what I got from a sales manager, I guess it was, who said that they had taken the tube

597 off temporarily during the Korean War. Otherwise, they have never notified us of any discontinuance and that wasn't any official statement.

XQ186. Well, yesterday, as a matter of fact, we car

find out if we get to the right Hotpoint official what they are putting on each of these machines, can't we?

A. I don't know. Now if they thought it was going to, in any manner, enter into this, I don't think they, based on what they have said, they don't want to get in between on any litigation or fight that might be going on.

XQ187. Well, disclosing the facts, Mr. Castner, just so there is no misunderstanding about it, never implicates anybody or does anything but call upon them to do what, under the law, he has to do anyway, to disclose all facts that have any bearing on the case. So, if we should call upon them I want you to realize that it isn't making them a participant in any way in the case.

Yesterday, there was some discussion of one of the licensees, either Easy or Speed Queen, that had a model which

I think you said they had told you was a model
598 which was being discontinued. Was that Easy or
Speed Queen, do you recall? As I recall the number, it was E-16, or some such.

A. Yes. In that Speed Queen letter that he said that was the only one. As I recall it I started to tell about that but you objected to it as hearsay because I got that information over the phone from Jack Murray. He told me at the time that it had gone flat and they didn't know if they were going to discontinue it or keep it in the line and I heard that same statement from the J. O. Hudson Company and others.

XQ188. I call your attention, Mr. Castner, to a large Speed Queen circular of thirty-two pages which bears this identification: Form No. 509-200 M-7/55, on the back cover, which according to the code would indicate the printing of 20,000 in July, 1955, would it not?

A. Yes, sir.

XQ189. And that would be about the time they were getting ready for the '56 model, wouldn't it?

A. Not in July. Normally I think like that Hotpoint folder was October, and I know in our case at Beam, why, generally November by when we got going with the 1956 Model.

599 XQ190. And I find in that on page 6 a Model A-16. Are you familiar with that model?

A. Well, that's the one. There is A-16. I don't remember the prefix letter, but I would assume that I could probably tell.

Mr. Carlsen: Was that the model referred to in the letter of May 13th? A-16?

A. (Mr. Castner) Yes. The description would identify it. Model A-16, Thriftomatic.

XQ191. And that model, they said in the letter, did not have the sediment trap and tube.

A. That's right. It's a manual water fill.

XQ192. You note it refers to a fluid drive. That is the fluid drive which is used in the Easy machines and shown on the cut on page 4, is it not?

A. Yes. I assume that it's a fluid drive according to our patent instructions. Now whether it would be the same as Easy, I don't know.

XQ193. In connection with their de luxe machine called Model A-12-A, they show a picture of the fluid drive which we have been here referring to as the fluid drive, do they not?

A. Yes. They show the same one on that other.

XQ194. They do not show any cut on the other 600 one but they speak of a fluid drive?

A. Well, very likely they do like the other manufacturers. Their basic structure is similar for the purpose of

getting cost and so it would be very likely in a common deal to do that just like Norge does, the company that you represent. They had maintained pretty much of a basic structure and they have what they call a push-button machine. That is even advertised as an automatic and doesn't even have a timer on it. You have to manually go over and set the thing. They came out with a machine that sold on a delivery basis so that they got less than a hundred dollars out of that, but that had practically all the basic structural features of their de luxe machine. It had the same motor, the same transmission, the same snubbing, the same sediment trap, the same ejector tube. It's their Model 405 and that was put out as an automatic washer and you had to manually fill it. Then you had to set it, push a button and the agitator would go on and wash forever unless you came back and turned it off and then you had to push a button
to throw it into the spin and then push that button
601 to shut off the spin and then go back and turn on
the faucets to manually fill it, and go back and turn off the faucets to shut the water off for the rinse and then push the button. That's been advertised extensively as an automatic washer. I have advertising copy of that which indicates, here, who would ever think that was not a fully automatic washer? At bargain prices. Model AW-405. That's the push button where you have to do all those things manually, but their basic construction has all of those features, the same motor, the same transmission, the same tub.

XQ195. The advertisement you are now referring to is the display ad of some dealer here in Florida, isn't it? In Des Moines, Iowa?

A. In Des Moines. They went all over the country. In fact, a member of the Washer Board of Directors, that be-

came quite a subject to be turned over to the Better Business Bureau and the Federal Trade Commission to ask Norge to cease and desist from permitting that to go on. It went on for a long time.

XQ196. I have before me in your specification book a page on that machine T-A-W-406. I assume that is
602 a latter year, isn't it? Which calls it the push-button washer and doesn't speak of it as being automatic at all?

A. Yes. But push buttons, that's what automatics have, or what Hotpoint has on their de luxe machine. They call it the super de luxe push-button machine.

Mr. Carlsen: May I call attention to the fact that the machine you are referring to is a 406?

Mr. Ooms: That's correct.

Mr. Carlsen: That's the 405 in the advertisement.

XQ197. They made those changes from season to season?

A. Yes. That might be. The description would tell.

XQ198. The advertisement, Mr. Castner, appeared some eleven months ago in May, 1955. Well, Mr. Castner, to go back to this Speed Queen now, there is a cut on the fluid drive on page 5 of the circular, isn't there?

A. Yes.

603 XQ199. And on page 6 where they list the specifications of the A-16 they describe the fluid drive in language that is applicable to the standard fluid drive such as you put on the Beam machine, do they not?

A. Yes, I would say that was standard practice, like I described the Norge on their cheap machine as well as their de luxe.

XQ200. Well, the implication would be, as I read this circular, that the same fluid drive is in the two machines?

A. That's right. They emphasized it more on the de

luxe machine and use it as a selling feature and soft pedal it on the leader machine.

XQ201. Now, I note on the A-16, on page 6, Speed Queen refers also to, 'vibrationless operation-balancing ring, centering springs and snubbers which counteract any tendency for tub to rotate off center, working together to hold the tub in vibrationless balance and take care of off-center loads. No bolting down necessary.'

That language describes the snubbers such as is shown on page 4 of the circular, does it not?

A. Yes. Yes, and those are snubbers similar to
604 what, to my knowledge, Hotpoint has used pretty consistently.

XQ202. And they are the snubbers which are covered by one of the patents which are covered in the Speed Queen license from the Solar?

A. That's right. The thing that threw me in connection with your question about Hotpoint, see, 'center spring and support' is the wording, I think that was in that. That threw me. Now, a center spring and support would be entirely different. That could be way off to the side and would pull to center and that's what our structure is. Whereas, in the Hotpoint, it said, 'center spring and support.' But center springs and center support would be descriptive of our structure.

XQ203. I just call your attention, Mr. Castner, to the circular of the de luxe Easy Spiralator Automatic Washer Model ADE, and I am referring to the back page, in addition to the sediment rejector or the advertisement that discusses fluid power and the snubbers.

A. That's right.

XQ204. Mr. Castner, yesterday you produced a
605 letter from the Hotpoint Company of November 12th, 1954, Plaintiff's Exhibit 33. That letter re-

fers to your letter to Hotpoint of November 9th, 1954. Do you have a copy of that?

A. I am afraid I do not. What is the substance of it?

XQ205. I haven't any idea. We were furnished a series of letters exchanged between Beam and Hotpoint but that letter is not among them.

Mr. Carlsen: Possibly if you read Plaintiff's Exhibit 33 letter, it will refresh your mind on that, Mr. Castner.

A. That was a letter that developed when Mr. Hubbard wrote us about the newly issued patent covering an improvement on the fluid drive. He wanted to get an opinion from us, I think, if he made a certain change in their design, whether we would consider that they still would be operating only under the old patent and not come in the improved patent.

XQ206. Well, you needn't tax your memory about it, Mr. Castner. I am going to ask Mr. Carlsen to produce the correspondence so that that letter having been
606 put into evidence will be part of the complete exchange of documents.

Mr. Ooms: Is it agreeable to you to stop until tomorrow morning, now?

Mr. Castner: Yes sir. That's all right.

(Thereupon the hearing was adjourned until 9:00 o'clock a.m., April 18th, 1956, at which time the following proceedings were had:)

(XQ207 omitted in numbering.)

By Mr. Ooms:

XQ208. To summarize, yesterday on matters of these licensees I think you testified that you did not know currently what two features, or at least two, each of the three licensees, Hotpoint, Easy and Speed Queen, were using. Is that correct?

A. I have not gone out in the field to buy machines, which would be about the only way you could verify the situation. My assumption is that they are all using the three features in some degree or other and in general
607 they are using all three.

XQ209. It is a matter that could easily be verified by checking with the manufacturers or getting the current models from the market place, isn't that right?

A. That's right. The literature might not be all conclusive. I think if they show it there, why, that would be conclusive. In the absence of something, it might be that they are just emphasizing on a certain model to get their sales story.

XQ210. Do you recall that we took a deposition from you a year ago last week in Chicago?

A. I don't remember the date. I remember the deposition that was taken in Chicago.

XQ211. Do you remember that at that time you said that these three licensees were all putting out the three features, the fluid drive, the snubber and the sediment trap, except that you pointed out that the current Hotpoint model which you had examined in January of 1955 did not have an outlet from the sediment trap? Do you recall that?

A. Yes. It was different. As to the outlet tube, I
608 couldn't see that. You would have to take the cabinet off. But it didn't appear to be similar to what I would normally expect of the annular recess and so forth.

XQ212. Now you had no positive information from any of these three licensees that time, that they have removed either the snubbers or the fluid drive from their current production?

A. No, sir. I have not.

XQ213. And if you did remove either of these two features it would require a substantial redesign of the machine, wouldn't it?

A. Yes, depending upon the degree of change.

XQ214. But both the snubber and the fluid drive are associated with the fundamental and basic chassis of the machine so that if you remove them you would have to make some very substantial constructural changes?

A. Not necessarily.

XQ215. Supposing you removed the snubber. You would have to make some other provision to prevent the machine from moving out of balance, wouldn't you?

A. Yes. That's correct. You would have to substitute some type of snubbing means.

609 XQ216. And that would go right to the heart of the support of the tub in its moving position?

A. It would become an important part of the structure.

XQ217. And as I understood your description yesterday as to the effect of the fluid drive, it enters the power transmission line at a point between the gear case and the agitator. Is that correct?

A. Between the motor and agitator or spin shaft.

XQ218. If you took it off you would have to substitute something?

A. Excuse me. I would like to correct that.

XQ219. Go ahead, sir.

A. The fluid drive enters into the spinning, only, and it is between the motor and the spin shaft. It does not cushion the transmission and I was in error if I included the transmission along with the spin shaft yesterday and the agitator shaft.

XQ220. It merely operates when there is direct drive from the motor to the tub to spin it?

A. That's correct.

XQ221. It doesn't participate in the operation of the agitator, which is an oscillating motion?

610 A. That's right.

XQ222. I think, Mr. Castner, you may have misspoken yesterday, because my recollection is that you had the fluid drive put between the transmission and the oscillating agitator.

A. I think I did mention either the agitator shaft or the spin shaft and it should have been just the spin shaft.

XQ223. But in either event, and I think that matter is unimportant, whether you misspoke or not, because we can straighten that out, but in either event, if you took out that fluid drive, you would have to make some provision in the machine for taking off the heavy loads at the start of the spin, wouldn't you?

A. Yes, sir.

XQ224. And that would require some substantial alteration of the machine or the electrical equipment?

A. It could and it could not. The thought is going through my mind that it would be conceivable to put in a so-called friction, or slip clutch, and of certain characteristics so that you might make that fairly interchange

611 able. It might not have the desirable characteristics of the fluid drive but it would function. The fluid drive cushion is not only for the initial starting torque of the spin, but it also slows up under excessive loads and a slip clutch ordinarily slips with the starting torque but after it engages, why, it is practically 100% engaged.

XQ225. And if any of your licensees had removed the snubbers and substituted some other provision to reduce vibration or had removed the fluid drive, that could be readily detected if you removed the cabinet and examined the operating mechanism of the machine. Isn't that true?

A. Yes. That could be observed if you stripped it down so that you had the bare chassis showing.

XQ226. And as far as you have been informed neither Hotpoint nor Easy, nor Speed Queen has eliminated either of those two features on their current production?

A. I wouldn't know that for sure. In fact, as I stated previously, and at the other deposition, I think that Hotpoint, on one low-end model did have a friction, or
612 slip clutch. At least I was told by the salesman on the floor (I didn't see it) that they had that in a low-end model.

XQ227. But you have had no official word at the factory and have not examined any of these machines to determine what the situation is?

A. Not recently. The last ones that I saw, maybe a year or sixteen months ago, that we had around there, they still had the fluid drive and the snubbers on it.

XQ228. One more question on that. If these licensees put on both the snubbers and fluid drive they would be paying the highest royalty rate that the license provided for and the addition of the sediment trap with discharge tube would cost them no additional royalty? Is that not correct?

A. That is correct. They can use any two of the three basic features and pay the top royalty.

XQ229. Yesterday you gave us some figures on the manufacture of automatic washing machines by Beam since World War II but gave us merely a gross figure up to the spring of 1955 and that figure was, I believe, 167,000 machines. Do you have the breakdown by years of the Beam production? It was 169,000, Mr. Castner.

613 A. A breakdown in what respect?

XQ230. Just the annual production of Beam of

automatic machines since 1947 or '48, when you first brought out an automatic machine.

A. The question, though, that's going through my mind is broken down in what kind of classification?

XQ231. Just annual figures.

A. Broken down by years? Yes, I do have that.

XQ232. What do you have for '47?

A. 1,359.

XQ233. And '48?

A. 11,348.

XQ234. '49?

A. 11,607.

XQ235. '50?

A. 25,578.

XQ236. '51?

A. 23,870.

XQ237. '52?

A. 18,746.

XQ238. '53?

A. 36,509.

XQ239. '54?

A. 28,071.

614 XQ240. Then for '55, you had, I think, the first quarter, 11,020?

A. Correct.

XQ241. And for the remainder of the year you had only a projected estimate of 31,000?

A. Yes, sir.

XQ242. Now do you have there on that same table figures for the machines without the tube from the sediment trap?

A. Yes, sir. For those same periods.

XQ243. When is the first one?

A. 1952.

XQ244. What is the figure?

A. 3,100.

XQ245. '53?

X. Wait a minute. Without tube, I am wrong. That's with the Roth tube. Without tube, there were none until 1953.

XQ246. And what is your figure there?

A. 6,586.

XQ247. '54?

A. 8,221.

XQ248. '55, first quarter?

A. 3,239.

615 XQ249. And the remainder of the year, you merely projected?

A. Yes, sir.

XQ250. And if you projected those at the same ratio as you have figures for the first quarter it would be just under 30% of 31,000, would it not?

A. Yes. That's right.

XQ251. And rather than being 7,500, it would be nearer a little over 9,000?

A. I took into consideration that at least the last quarter of the year would be getting under way in November or December with pretty heavy production on the new de Luxe and semi-de luxe models so that the proportion there would not be the same.

(XQ252 omitted in numbering.)

XQ253. But those figures are available at Webster City?

A. They should be available, yes. Unless the new crowd that took ownership on July 1st have abandoned the same record keeping that we had there before.

XQ254. Now, Mr. Castner, you said yesterday that in making these machines for Dexter and Philco you
616 were making them as more or less a surplus supply problem and were giving them a machine without a tube discharge from the sediment trap. Is that true of all the Dexter and Philco production?

A. My recollection of it was that that was the situation at least up to last July.

XQ255. And I assume that the Dexter and Philco were both aware when they purchased the machines, what the specifications were for the machine and that the tube discharge had been omitted?

A. Yes. They were advised of the specification and they wanted to dress it down as much as they could to get the price, because, like I mentioned, it was really a distributor on top of a distributor and then we did not care to put it on for the reason I mentioned, that it would give them what we considered a de luxe feature and cause more competition with what we felt were our long range customers.

XQ256. But you would have sold them the machines with the tube discharge if they had insisted upon it?

A. I don't know that we would have. I think at that time we felt pretty strongly that we did not want to
617 supply more or less of a stop-gap customer with that feature on when it was so flexible we could take it off. I have that definite recollection that that was a very important consideration in our minds at the time.

XQ257. Now you do make, as I understand it, a lower priced model for each of your four estaolished outlets, Western Auto Supply, Gamble-Skogmo, Firestone and Associated Merchandising Corporation?

A. Yes. They might vary as to specifications, and I

think in the case of Associated Merchandising Corporation that they have pretty much of an in-between model that they use along with a de luxe model. So that in their case, their low end would really be classified as an in-between model.

XQ258. But quite apart from the price range it falls into, there is a model supplied to each of those four distributors that does not have the tube discharge from the sediment trap?

A. I think that that is correct. I don't have all the latest information but that would be pretty much the tube with the idea of the specifications to have it about that way.

XQ259. Yeserday you referred to some photo-
618 graphs of these cut-a-way models, both of Beam and Norge, and you mentioned that you had seen them, I believe, after they had been cut away by Mr. Lund. Is that Arthur Lund who cut them away?

A. Yes, sir.

XQ260. And I assume that is in connection with this lawsuit that he prepared those models?

A. That's right. On the instructions of Mr. Carlsen.

XQ261. Is Mr. Lund an engineer?

A. Well, he is a practical engineer.

XQ262. Does he work for the Beam Company?

A. No. He was on our payroll for that period in 1944, I think, and '45, for a period of about 2 years. He was normally on the payroll of Solar Corporation at Milwaukee on the development of equipment for battery manufacturing so we more or less borrowed him during that period.

XQ263. Do you know where he has been employed since '45?

A. When he finished up with the 2-year stretch or so that he worked for us, he went right back on the Solar pay-

roll and continued on the work that he had been on for several years.

619 XQ264. Do you know whether he is still an employee of Solar?

A. Solar is no longer in existence.

XQ265. Well, of Gamble-Skogmo?

A. The battery business was sold by Gamble-Skogmo to Gould National Company, a year ago last January, I think it was.

XQ266. And did he go with it as far as you know?

A. No. So he's not in either organization at this time.

XQ267. He is an independent consultant?

A. I don't know just what Art is doing. I haven't seen or heard from him in some time.

XQ268. Last year, when we took your deposition we asked the question that had been previously asked of us in an interrogatory as to whether any comparative tests had been made of the efficiency of the Castner type of discharge and the Roth type of discharge where the outlet of the tube is in the rear as the tub spins, of the inlet of the tube and at that time you replied that you made no such comparative tests. Have you since that time made any such comparative tests?

A. No, sir.

620 XQ269. Have you had any made for you?

A. Not to my knowledge. See, it was shortly after that that I left the active management of the Beam Company.

XQ270. You have had no report of such tests?

A. No, sir.

XQ271. Now yesterday, you also spoke of the difficulty of demonstrating the method of discharge because of the speed at which this emptying of the tub is accomplished

by centrifugal force. Do you know how long it takes the tub, with normal fill and with the normal load of clothes, to empty the water after the washing on the emptying?

A. I think at times we have checked that and I have known what it was, but it's nothing that has left its mark in my memory to say. It would be something around, well, it would depend on what you would call emptying. To get the main body of water out of them, I imagine in a matter of some 30 or 40 seconds.

XQ272. Isn't it quite a bit less than that? I have heard the figure 6 seconds. Now am I way off?

621 A. Well, it would depend on the type of escape holes and the speed, and my recollection would be much more than 6 seconds. Now maybe in a case with their fluid drive we start up slower and we will get that slippage so that it might take longer than if one had a friction, or slip clutch in there.

XQ273. In your Beam machine, does your emptying spin begin quite promptly after the wash cycle has completed or is there to let the dirt in the water settle or any other pause?

A. No. It starts in, I think, simultaneously with the cutoff of the agitator.

XQ274. Practically instantly? A few seconds?

A. Well, I don't think it's even a few seconds. I think the actuating mechanism shuts off at the same time that it starts up the spin.

XQ275. And the water at that stage is quite turbulent and still in action from the operation of the agitator?

A. Yes. It stops instantaneously.

XQ276. Now the force which is employed to empty the water from the tub is centrifugal force, isn't it?

A. Yes, sir.

622 XQ277. And your tub spins at a little over 600 or a little less than 600 revolutions per minute?

A. That's right. At 600. A little bit over, generally. There's a variation.

XQ278. And the centrifugal force in a tub of dimensions you use is very great at that speed, is it not?

A. Yes. That peripheral speed would be pretty fast. I think it could be calibrated.

XQ279. Well, there's a regular formula for calibrating it, isn't there?

A. Yes. It would be 600 times the diameter of the tub, then. If it was going 600 a minute, and that would be about five times 600, would be 3,000 per minute, roughly, I would calculate.

XQ280. That's more than 30 miles an hour, and the actual force would depend, of course, on the mass of water you had in there, wouldn't it?

A. Yes.

XQ281. Have you ever made any studies of the forces that are involved when you use the Roth type of tube where you have a discharge end trailing behind the inlet end of the tube with respect to how much, if any, addi-
623 tional force is provided by that feature?

A. No, sir.

XQ282. That, too, could be calibrated, couldn't it?

A. Well now I don't know enough about the engineering technique to answer that intelligently. I have never done anything like that and I don't know that the boys have.

XQ283. Have you ever made any observation as to whether there's an observable difference between the rate at which the sediment trap empties with the Castner type of tube as compared with the Roth type of tube?

A. That would be difficult to observe. The only difference that anyone could observe there in our engineering department from our limited testing facilities of that kind was a disputed observation as to whether the water started to come out of the Roth tube just a little faster. But after it once got started, what transpired within the sediment tube or the volume of water or velocity, I don't know of any measurements of any kind that we made in our laboratory.

624 XQ284. Yesterday, when you began describing the Beam machine, you stated that before the war there had been a start in production of automatic washers, the first being the Bendix machine. Do you recall about when that appeared on the market?

A. My recollection would be possibly sometime in the latter part of '38 or '39.

XQ285. Were there any other automatic machines on the market before the war?

A. There was a Blackstone machine, made at Jamestown, New York. It never attained any very big volume and it seemed to me that the 1900 Corporation might have been out with theirs.

XQ286. That's the Whirlpool, isn't it?

A. They later changed it to Whirlpool Corporation.

XQ287. But the machine was called the Whirlpool?

A. They supply Sears and as such, it had the Kenmore label, on anything that they might have produced for Sears.

XQ288. Now, the Whirlpool, or Kenmore, was a machine such as you described yesterday with a double tub, a perforated tub within another tub?

A. Yes, sir.

625 XQ289. And what was the Blackstone?

A. The Blackstone was a solid tub.

XQ290. Do you recall whether it had tapered walls?

A. Yes. It had tapered flutings in it. My recollection is the main part of the walls were vertical and then they had a tapered V outward. The size of the 'V' was reduced as it approached the bottom and faded into the tub.

XQ291. That is about the kind of tub that you show in the patent drawing of the Castner patent in suit, isn't it?

A. Yes. On that, we did show a similar fluting.

XQ292. That type of tub where you put flutings into the wall is a little more difficult and expensive to fabricate than a circular tub, isn't it?

A. I would estmate it would be.

XQ293. A little more difficult to keep clean, also.

A. Yes, sir.

XQ294. In commercial production, Beam did not build the tub like that but also built it with a regular cylindrical wall with a slight taper to it?

626 A. With a slight taper. That's right.

XQ295. And several of the companies that are now making machines are building tubs with tapers because they empty over the top, aren't they?

A. Yes. There are some. There's, well, Thor, out of production, and offhand, principally, our licensees and Beam and Norge.

XQ296. Well General Electric empties over the top?

A. General Electric.

XQ297. What about Frigidaire?

A. Frigidaire. That's right.

XQ298. And Kelvinator?

A. Yes. Kelvinator.

XQ299. And, as I understand it, the double wall tubs such as Whirlpool, Kenmore, empty over the top of the outer tub.

A. No. They, see, that outer tub does not spin ordinarily. In the case of Maytag, it does. And that goes out over the upper edge of the outer tub. In the case of Whirlpool, that outer tub does not spin and it has a valve that opens and closes so that when they drain, the scum and suds goes right down through the clothes.

627 XQ300. Well now, the thing that distinguishes the automatic from the other type of washer is that you have an electrical switching system that automatically puts the machine through a so-called cycle of washing, rinsing, emptying and to get most of the water out of the clothes? That essentially the feature that makes the machine automatic, isn't it, the automatic cycle?

A. Yes. And of course, the extraction is done by centrifuging instead of through a manually fed wringer.

XQ301. You know that feature of centrifuging has been used in the oldest, old Easy manual machine, had it not, where you took the clothes from the wash tub and put them in a separate little spinner that was built onto the tub chassis?

A. Yes. They are so-called spin-dried, the main difference there was that the clothes had to be manually handled and lifted from the tub in which they were washed into that separate compartment and there were others that made such machines.

XQ302. They have been on the market for some time, even before World War II?

A. Yes.

628 XQ303. Now, yesterday you were asked something about cost of development of these inventions or features of your automatic washing machine and you had some figures as to what it was costing to run the laboratory at Beam and then you made some estimates with re-

spect to the cost of development of the sediment trap. Now, you have no actual cost figures on the work done on the development of the sediment trap, have you?

A. No. We, as a smaller company, didn't have a cost breakdown or job sheets on that. It was all in the pool, there of what was being done in the development.

XQ304. You were the man who actually worked out that design of sediment trap and discharge as incorporated into the first Beam machine, aren't you?

A. Yes, sir.

XQ305. And when did you begin work on that?

A. That patent was filed in 1945 and I had worked on that during the time that some of those negotiations went on. I would say that it probably started a year or so prior to that filing date.

XQ306. Did you have a sediment trap incorporated into those prototype machines that Lund and his 629 associates built?

A. Yes, we did.

XQ307. And he worked on the machine in '44 and '45, didn't he?

A. I don't think he did anything on our machine. The Beam machine under the Castner—was under the Castner-Lund patents 'til '45.

XQ308. He completed his assignment within that year, didn't he?

A. I think he went on into '46.

XQ309. But before that, you had filed your patent application in the year, 1945, on the sediment trap?

A. Yes, sir.

XQ310. He had no part in the development of the sediment trap, did he?

A. No. That was something that I had worked on pret-

ty much prior to Lund coming into the picture on our later machine. He was still working, he and Knapp were still working their design of machines during a period when I was doing work on the sediment trap.

XQ311. Oh. You were not one of the research men that was included in that figure of payroll that you
630 gave yesterday?

A. No. My time, well, was never broken down into engineering expense. It was in the general overall management of the company.

XQ312. Well, what was the company doing in the year 1944? You were in war production, weren't you?

A. Yes.

XQ313. You had no men assigned to washing machine development in that year, did you?

A. We were trying to carry on some work but the demands of war were such that it took the most of the time of our own engineers. We didn't have too many engineers then and that was why we went to Lund and Knapp so that they could give it a concentrated effort.

XQ314. But that was done in the year '44 when things had begun to lighten on the war demands, late in '44, wasn't it?

A. Well, you see, Lund and Knapp had nothing to do with any war work and so the war work could have been going on 100 per cent and they still could have been working on it.

XQ315. Well, I am not concerned, Mr. Castner,
631 about your arrangements with them, but I am just trying to find out in detail from you what was done in the development of this sediment trap that you estimated cost $50.000.00.

A. That was not the only, the original design as I

explained it yesterday. That is what I estimated was spent from the start up until the present time or the time that I left the company.

XQ316. On the sediment trap?

A. Yes, sir.

XQ317. Well, you made only slight changes in the shape of the trap; it always was part of the lower casting of the machine, was it not?

A. That's correct. But in the dimensions that were involved it at times necessitated building up and welding and then machine routing out, with a little router, power router.

XQ318. Are you speaking now of the prototype model or production manufacture?

A. After production was under way and shortly prior thereto. As an example, we paid your good affiliate company, the Ingersoll Steel & Die at one time, I think it was $3,750.00 to make up a tub where that recess was
632 changed in an effort to get the recess formed in the tub without having the separate casting. Now, we had them make several samples of that tub and we had that in our laboratory for a period, I think, of six months, working on that. It involved a change in the casting on which that was mounted and additional supports for it. It involved trying to figure out a lip that could be either formed in the tub or with some kind of an inexpensive lip that could be put on it.

I mention that as an example and I would say that in following through just that one idea, alone, that in addition to the $3,750 that was paid for that very die that in our engineering department it could have involved enough more to bring that easily up to $10,000.00 just on that one little project.

XQ319. Well, let's stop there. That was the project of attempting to reduce the cost of your manufactured product. That all occurred after your patent had been issued, didn't it?

A. Yes. That's right But it was still expense in connection with the development and improvement of the sediment trap.

633 XQ320. It was an attempt to put the trap into the pressed steel tub rather than in the casting in which you have always had it in the commercial product. Isn't that correct?

A. That's right. But nevertheless, was part of the development expense that has gone on in connection with that.

XQ321. When you used that figure of $50,000.00 yesterday you were including not only the original development of the concept and the design but these attempts from time to time to change the production design to reduce costs. Isn't that correct?

A. That's correct.

XQ322. You have never been able to put the trap anywhere except in that base casting, have you, in production?

A. No. We have never perfected any design that we could put into production other than the casting. There, again, that we spend a lot of money and scrapped molds and dies in our efforts to get the trap functioning and from a functional and cost angle. So that those all entered into the estimated cost and they are a specific part of the development of that trap.

634 XQ323. But most of the $50.000.00 you referred to yesterday was referring to work that was done after your patent application was filed?

A. The majority of it would be. If you are going to

dress it down to that, what happened before the patent was filed, that's correct.

XQ324. Mr. Castner, you mentioned yesterday that in the spin cycle of the washing machine the water generates a vortex in the tub. That is an inevitable effect of spinning a body of water, isn't it?

A. Yes, sir. It's smooth to start with and then it's slightly rounded in the center at a lower level and then it finally comes to a point and then that vortex point moves out so that instead of being an inverted cone eventually, why, it's an inverted tapered cylinder, sort of.

XQ325. And it occurs quite independently of whether you have a double walled tub or a single walled tub. If you spin a tub that has a body of water in it, it will create a vortex?

A. Yes, sir.

XQ326. Yesterday, you discussed in connection with your licensees that some of them had procured
635 technical help under either the licenses or separate technical assistance agreements and some of them had procured the use of your tools for the manufacture of tubs and some other minor parts. That technical assistance and the opportunity to use your tools was never extended to anybody other than your licensees, was it?

A. Not to my knowledge.

XQ327. Now, in connection with the Hotpoint license you mentioned that General Electric Company use the patented features licensed to Hotpoint. That would require a sublicense from Hotpoint under the terms of the agreement, wouldn't it?

A. Yes, sir.

XQ328. And General Electric never did procure such a sublicense?

A. They never did. But originally, they anticipated taking it and there was a delay in concluding that original license agreement, as I recall it, of 90 to 120 days when Schenectady came in with the idea that they wanted to have an opportunity to use it.

XQ329. Well, let us confine the answer to my question here. There never was a sublicense extended
636 to General Electric?

A. No, sir.

XQ330. And General Electric never did put on its machines either your fluid driver, your snubber arrangement, or your sediment trap?

A. No, sir.

XQ331. And they are making an automatic washer which has a single cylinder which empties over the top—I mean a single-walled tub which empties over the top and generally performs like the other single-walled tub washers?

A. Could I look at that? Those folders there. My recollection of what GE are doing is not very clear.

XQ332. Certainly. Well, I am not going to press you for details. I just want to know in general what kind of machine they are making according to your best information.

A. Well, they are screening their water to get rid of their sediment and things. They are circulating their water around. They put a screen on the top of their agitator in some kind of a fashion but they do have a solid-wall tub and they flush it over the top.

637 XQ333. They spin to empty?

A. They spin to empty. Yes.

XQ334. Now, you wrote Hotpoint a letter on April 12, 1955, which was shortly before we took your deposition in Chicago, in which you said to Mr. Hubbard—

Mr. Carlsen: (interrupting) That was after, Mr. Ooms, you took the deposition.

Mr. Ooms: Oh. Two days after. You are correct. Beg your pardon.

XQ334. (continued) Two days after we took the deposition, you wrote Mr. Hubbard and on page 2 of the letter in the third paragraph you say to Mr. Hubbard.

'I know you have worked away from the sediment tube but if you get such a spin tube assembly you can see what we have done in that direction. I think you ran into trouble with the tube clogging because you used the small tube and had a large opening from the sediment tract. This meant that it was easy for marbles or coins, hairpins and so forth to get imbedded in the tube and cause it to jam. We use only the one tube and with an opening in the
638 sediment trap smaller than the diameter of the tube so that anything that gets through that ejection opening in the trap can readily travel out of the tube and we very seldom hear of any difficulty in that respect.'

And there is some more about that. Do you recall writing that letter to Mr. Hubbard of Hotpoint?

A. Well, it sounds like my letter.

XQ335. Well, it is one that you provided us with, Mr. Castner, through your counsel.

A. Well, that would be my letter then.

XQ336. I wondered how you had procured the knowledge that they had worked away from the sediment tube as you stated at that time.

A. Well, they worked away from it to some degree, and that I had observed that like I testified previously and just what they are doing, I didn't know, and I was feeling out if that was anything that bothered them, I wanted to volunteer that information there so that they could get the full

benefit of any help that I could give them there if they were wavering on account of that.

XQ337. You knew that, for a while, they actually put out a machine that had the sediment trap in it
639 and had rubber stoppers put into the discharge openings, did you not?

A. That's the one that I observed in January. Now, how many models and to what extent, I didn't know.

XQ338. Yesterday, you testified, Mr. Castner, to a meeting, or two meetings, with the gentlemen in the patent department at Borg-Warner Corporation about the Norge machine. The one meeting, as I recall in April, 1952, and the next one in June, 1952. Up to that time you had not sent Borg-Warner any formal notice of infringement, had you?

A. Well, I don't know what your legal terminology is for 'formal notice.'

XQ339. Well, I am not attempting to use the words in any legal or special sense. But you merely called Mr. Ardis' attention to what you thought was a collision with your patent rights. Is that correct?

A. That's right. I had quoted from Mr. Carlsen's letter in which he referred to the fact that he felt it was infringing on our patent. We gave them the patent number and in Mr. Carlsen's letter he said that it functions ex-
640 actly like ours. If you put a screen over ours, it would be the identical same thing.

XQ340. Well there was that difference, was there not? That for the dirt to get into the sediment trap of the Norge washer it must sift through one of those perforations over the trap?

A. Yes, sir.

XQ341. And you have a completely open annulus between the lip of the trap and the skirt of the agitator?

A. Yes. We have an open annular trap in ours where that the dirt goes into, and in the Norge it goes through the holes but it goes into the trap and spins out the same way.

XQ342. Well, now, Mr. Castner, when you went to Borg-Warner and visited with them, they made their position clear that they questioned the validity of your patent, didn't they?

A. They did bring that up and, as I recall it, at that very first meeting, why, Mr. Carlsen stated that we certainly didn't want to embark upon any litigation or fight and we have cleared up our patents through the Patent Office and gone through this re-issue to have it
641 clean in view of all prior art but if we have muffed up something and you have information that isn't known to us that would invalidate our patent, why, we would certainly appreciate you telling us that information at this time so that we won't be spending a lot of time and money in litigation.

XQ343. Well, they did bring out their references, didn't they, and discuss them with you?

A. I am not sure what references they made. I think Dunham was one of them and he pointed to the fact that that had already been cleared through the Patent Office.

XQ344. Are you sure that Dunham had been cited at that time?

A. I am not sure about that but there were, I say I thought Dunham was one. Now, maybe I better not even try to recollect. But there was nothing there that they disclosed to us that we felt had any bearing on it.

XQ345. Well, all I wanted to ask you about is that there was no repudiation, no violent disagreement. You took the position your patent was valid and they took the position it was invalid. Wasn't that the necessary effect of that conference?

642 A. I don't think that they presented it very strongly that ours was invalid. I think it was that there were some prior arts that they felt that they thought might be brought up. We didn't know just what the position was. They indicated that they might go along with a license at some figure, 10 or 15 cents or something like that.

XQ346. But that was never agreed to; that was merely negotiation?

A. That's right, and, but as to an outright stand, the patent was invalid, my recollection isn't clear that they had taken that stand.

XQ347. When you came to the second meeting they told you that, while they had no confidence that your patent was valid, that they were redesigning their structure to avoid difficulty. Isn't that correct?

A. Yes. We, in effect, we interpreted it as an admission that their first design was doubtless infringing and they were trying to redesign it so that it would not come within the scope of that, but that's something that as to whether they did or not, why, that's some that I leaned on Mr. Carlsen and the legal advice.

643 XQ348. Well, at that meeting in June, '52, they showed you the new design which is their current production, didn't they?

A. They showed us a design. I don't know. At a tangent. I don't know if it's identical with what they have in their production.

XQ349. And up to that time you had not made any machines that had the so-called Roth discharge tube on them, had you?

A. No. And neither had they. But we had the Roth patent application as I recall it, in process.

XQ350. That is correct. But you had not disclosed the Roth type of tube to Borg-Warner and they independently

showed you a design which became their second design. Isn't that correct?

A. That's correct. We had a lot of other patents in process. We didn't show to them, too.

XQ351. And at that time after they showed you their second design, then you called their attention to your pending Roth patent application?

A. I think that is the sequence.

XQ352. And then after that, you filed an application for re-issue of the Castner application?

644 A. I am not clear as to those dates.

XQ353. Well, that can be developed from the documents themselves, can't it?

A. I think so.

XQ354. Now, you mentioned yesterday that there had been some early discussions with Borg-Warner about a transmission patent issued to a man by the name of Patch. Now, you did procure for Borg-Warner a sublicense under the Patch patent, did you not?

A. That's right. And on a reasonable basis where it cost them five cents more than what we paid Patch.

XQ355. And you got the difference, did you?

A. Well, as a non-exclusive license, they paid Patch 15 cents and they paid us ten.

XQ356. So that that entire transaction which you related here yesterday turned out to be a perfectly amicable commercial transaction?

A. That's correct. On a very friendly basis. And we interchanged for not only on the transmission but on the pump and possibly on the design of the cast case and we invited them into our plant. I think they were in there a couple of times to gain whatever knowledge they

645 could. It was that kind of a very friendly arrangement.

XQ357. Mr. Castner, I would like to develop just briefly the details from the manufacturing standpoint of the difference between your machine with and without the discharge tube. Now we pay no attention to the other features of the machine. But, what is involved when you make this lower cost machine in which you do not have the discharge tube as compared with the higher priced model in which you do have the discharge tube? You use the same base casting, do you not?

A. That's right. We put a plug in there so that the discharge hole from your casting is solid for a thin section.

XQ358. In fact, the casting is actually bored out for a discharge tube and you plug that bore. Is that correct?

A. I am under the impression that we had a plug in there, a shorter plug, so that the wall was solid for the assembly without the tube and when the tube was going to be used, the plug was longer so that in fact other than a little flashing it made a hole clear through.

XQ359. Well, is that a matter of the original
646 casting or do you modify the casting after it is prepared when you want to leave the tube off.

A. Well, now as to that detail of manufacture, I wouldn't swear to it but my impression is, like I just described it.

XQ360. Well now, in addition to that bore through the wall of the sediment trap I think you have to have two screw holes there to mount the flange that holds the tube in position and seals the tube, do you not?

A. Yes. There's a tapping and threading operation, I guess.

XQ361. And then you have the flange itself, with some kind of compressible gasket that you put in there, do you not?

A. Yes, sir.

XQ362. And then you have the aluminum tube?

A. Yes, sir.

XQ363. Do you know what those additional parts and their addition to the machine cost in manufacture on the scale in which you were building at Beam?

A. I think it was somewhere in the neighborhood of 75 cents including the labor. See, there is some
647 clamps at the top to hold the tube in place and it necessitates, I think, a separate supply of tubs. I don't think the tubs where the tube is not used have that hole put in there at the time we get them.

XQ364. Do you have the breakdown of cost at your plant on that particular feature in operation?

A. Well, it was costed out there and I know it represented what we considered a sizeable item. When you get into a volume of production even in our little volume, we thought it was big when you thought of 50 to 75 cents, we were performing quite some operation in taking cost out when you know that off.

XQ365. Who did the costing at the factory?

A. Well that would be done by, normally, under my assistant Leisey who is now general manager and under him, they had a production engineer.

XQ366. And they do, in view of your rather limited size of your factory, you do do some cost studies and analysis so you can price your machines?

A. Oh, yes. We do the best we can from breaking it down for material and labor.

648 XQ367. And you don't have any of the cost data with you here at this time that would enable you to answer that question?

A. No, sir.

XQ368. I would like your counsel to produce that at the time of the trial. Your actual costs on the difference between the addition of the discharge tube and the elimination of the discharge tube.

I only have one more question, Mr. Castner. As I recall it, you are retired from the active management of the company but were still vice president of Gamble-Skogmo. Is that correct?

A. That's correct.

XQ369. And I am not interested in the amount but, I assume you still have a salary?

A. No. I do not have a salary.

XQ370. Do you have pension rights?

A. Yes. In view of the arrangements that were made for me at the time I retired, why, I agreed to follow through.

XQ371. And only one other question: Do you have—or two—do you have any interests in any financial recoveries that might follow this lawsuit? Independently of your interests as an officer of the company?

649 A. Yes, sir. I would have a very moderate participation.

XQ372. And do you get any royalties that are paid by these licensees, either Hotpoint, Easy, Speed Queen, or Beam, under these patent licenses under which so many of your patents are involved?

A. Yes, I do. It would be that same moderate participation that would develop.

XQ373. Is that interest in the royalties (I am not inquiring about the amount, Mr. Castner), but is that interest in the royalties from these licenses something that has been continuing through the years or was that arranged for when the corporation changed a year ago?

A. No. That has been in effect for a period of time,

Mr. Ooms: Those are all the questions I have, Mr. Castner.

(At this point the hearing was recessed for a short time after which the following proceedings were had:)

(End of page.)

650 Re-Direct Examination by Mr. Carlsen.

RDQ1. Mr. Castner, yesterday there was reference made to a letter from Hotpoint to you dated November 12, 1954, which was marked Plaintiff's Exhibit 33 and in which reference was made to a letter from you of November 9, 1954, and Mr. Ooms asked if you had a copy of that letter. You did not locate one at the time but have you found one since?

A Yes. That's one, November 9.

RDQ2. That is the letter that's referred to in Exhibit 33?

A. Yes.

RDQ3. And is that the letter that you wrote to Mr. Hubbard as of that date?

A. Yes, sir.

Mr. Carlsen: I will ask the reporter to mark this copy as Plaintiff's Exhibit 33A which I show to Mr. Ooms and I will be glad to give you a copy as soon as I have an opportunity to prepare one.

(Whereupon the document above referred to was received in evidence as Plaintiff's Exhibit No. 33A
651 and marked for identification.)

RDQ4. You were also asked to locate, if you could, a copy of your letter of May 10, 1955, addressed to the licensees and which is referred to in the three letters, Plaintiff's Exhibits No. 30, 31 and 32. Were you able to find that letter?

A. No, sir.

RDQ5. Did you make any effort, or have you made any effort since then to locate a copy at any other source?

A. I did phone the Beam factory at Webster City and talked to my former secretary and I asked her to make a search of the files and if she could not find those copies of the individual letters to the licensees that she endeavor to go back through her notebooks and see if she couldn't find the shorthand notes and if she could, then to make up a copy.

RDQ6. You were also requested by Mr. Ooms yesterday to locate, if you could, copies of some certain Beam circulars that you had referred to in your testimony and also to locate, if you could, such account records
652 as might be available in connection with the payments of royalties from the various licensees. Have you made an effort in that direction?

A. In my phone call, I talked to our service manager and he said that there were some copies of those folders, that they had never been disturbed.

RDQ7. You mean the Beam circulars?

A. Yes. And I asked him to mail you some copies of them.

I might point out that that was kind of a noble experiment, that Beam machine, and we spent no money on tooling. We took some old abandoned trim and we did get a Beam nameplate. That's the only money that we spent to make up a sample to photograph. We had no advertising department and it was handled primarily by the service manager with the printing firm that prints up his operating instruction sheets and service manuals that are included with each washer.

RDQ8. Well, apparently, Mr. Ooms was only interested

in the circular itself and you have agreed to provide copies?

A. I have asked that copies be sent to you.

RDQ9. Do you know of your own knowledge
653 whether any of those circulars were actually distributed?

A. They were never distributed. I don't think that it is possible for any of them to ever reach the public in any manner because we found that as that competitive condition was getting tougher that we had such a poor design and the makeshift improvised manner we had it and all, that we just abandoned the whole thing.

RDQ10. Yesterday you referred to an advertisement that appeared in the Des Moines Tribune for May 12, 1955, and made some comments about it. Will you please produce that advertisement again?

Mr. Ooms: I object to any further inquiry on that subject and will move to strike the witness' answer of yesterday when it is presented in court as not responsive and in no way connected with the defendant in this case and not relevant to this case.

RDQ11. Do you have that circular, Mr. Castner?

A. Yes, sir.

RDQ12. Mr. Castner, I will ask that this tear sheet be marked in evidence as Plaintiff's Exhibit 39.

654 Mr. Ooms: I shall make the same objection to the introduction of the document when it is offered into evidence.

Mr. Carlsen: That's all the re-direct examination I have, Mr. Ooms.

Mr. Ooms: I have nothing further but I would like to put on the record more or less formally my requests made through the course of the deposition for actual royalty reports from licensees, if plaintiff is going to put any in

evidence on royalties; and also actual record production figures from the factory on Beam's production for any periods that plaintiff thinks are relevant and, where possible, the breakdown between the machines with and without the discharge tube; also the cost data on the difference in cost incurred by the omission or inclusion of the sediment discharge tube and any of the correspondence that I have inquired about; and asked specifically about to complete the documentary interchange with the documents
655 that have been offered here for identification.

I think those are about all the requests I have made, Mr. Carlsen, and I think we shall need, on this record, a stipulation that the original deposition may be sent directly to Mr. Carlsen at Chicago? And where do you want it sent?

(Discussion off the record.)

Mr. Ooms: To Chicago or any address that Mr. Carlsen furnishes the reporter. It is agreeable to counsel for the defendant, if agreeable to counsel for plaintiff, and agreeable to the witness, that the signature and execution of the deposition by Mr. Castner may be waived.

Mr. Carlsen: That's agreeable with me. Is that agreeable with you, Mr. Castner?

Mr. Castner: Yes.

Mr. Ooms: It is also agreeable to counsel for the defendant that all exhibits marked by the reporter may be left in the custody of the attorney for the plaintiff.

Mr. Castner: I did not answer completely the part
656 of the question that you posed to me in regard to what I might have done for records on the royalties. In my phone call to the Beam factory at Webster City yesterday, I also asked Mr. Cummings to route out any vouchers or letters that he might have that accompanied the

check for payment of royalties from the licensees. He stated that he did not know if there was a complete continuity but he did see that he had several of those vouchers as well as letters, most of which showed the units as well as the amount of royalty paid. He was to get that information as complete as he could and send it on to you at Minneapolis.

Mr. Carlsen: There's only one other observation that I would like to make, Mr. Ooms before we close. And that is that we will make every effort possible to provide you with the information you have requested but I would like to have it understood that such information that is

657 not available and cannot be furnished, we will rely in lieu thereof entirely, as we are willing to do anyway, on the testimony that has been given by Mr. Castner. I merely mention that because if we cannot locate all of these records and things you want, why, we won't be able to provide them But to the extent that we can accumulate them and get them, we will certainly make them available to you.

Mr. Ooms: Of course, on that, I appreciate your offer of cooperation but wherever better evidence is available, of course, the law requires it to be produced so I shall rely on the best evidence rule.

I might suggest also, Mr. Carlsen, that if you can borrow from Mr. Castner that specification book for current models I think we will find that useful in view of the fact that a large part of his testimony did refer in part to various models pictured therein.

658 Mr. Carlsen: I have no intent of encumbering the record with that large book. If you want to have it, Mr. Ooms, and introduce it as a part of your evidence, you may do so.

Mr. Ooms: I do not want to introduce it as part of my

record but if all of your witnesses have no further information than Mr. Castner has on what your licensees are doing I shall of course move to strike all of your evidence of commercial success, if unproven, and that's the situation in which you may find that specification book helpful. I am not trying to prove commercial success; you are.

(Hearing adjourned.)"

(End of Castner deposition of April 16, 17 and 18, 1956.)

659 IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

The deposition of George P. Castner, called by the defendant for examination pursuant to agreement of counsel for the respective parties, and pursuant to the Rules of Civil Procedure for the United States District Courts pertaining to the taking of depositions for the purpose of discovery, taken before Dorothy L. Brackenbury, a notary public within and for the County of Cook and State of Illinois, at Suite 1100, 209 South LaSalle Street, Chicago, Illinois, on Wednesday, April 6, 1955, at 10:00 o'clock a.m.

Appearances: Messrs. Brown, Jackson, Boettcher & Dienner, by Mr. Andrew E. Carlsen, of counsel, appeared on behalf of the plaintiff;

The firm of Casper W. Ooms, by Mr. Casper W. Ooms and Mr. Robert C. Williams, and Mr. Carl G. Stallings, of counsel, appeared on behalf of the defendant.

660 Mr. Ooms: The deposition of Mr. George P. Castner is being taken pursuant to informal notice and arrangements made informally by the respective counsel.

Present for the plaintiff is Mr. Andrew Carlsen; present for the defendant are Carl G. Stallings and Casper W. Ooms.

GEORGE P. CASTNER, having been first duly sworn, deposeth and saith as follows:

Direct Examination by Mr. Ooms.

Q. Will you please state your name?
A. George P. Castner.
Q. Where do you live, Mr. Castner?
A. Webster City, Iowa.
Q. Are you employed?
A. Yes, sir.
Q. What is your occupation?
A. I am executive vice-president of the Solar Corporation.
Q. That is the plaintiff in this lawsuit?
A. That is right. And general manager of the Beam Manufacturing Company, a division of Solar.
661 Q. Is Beam Manufacturing Company a separate corporation or merely a division within the Solar Corporation?
A. It is a division within the Solar Corporation.
Q. What does the Solar Corporation do, Mr. Castner?
A. Their business at this time is the manufacture of paints and varnishes at Cudahy and the manufacture of washing machines at Webster City in the Beam division.

Up to the first of the year they had a battery manufacturing operation which at that time was transferred on a sale to the National Battery Company.

Q. What washing machines does the Beam Manufacturing Company, division of Solar Corporation, manufacture?

A. They manufacture under private label, primarily, and the principal accounts are Firestone, under the Firestone name, Gamble Stores under the name of Coronado,

the Associated Merchandising Corporation, a big organization for department stores out of New York, under the name of AMC, and the Western Auto Supply Company of Kansas City under the name of Wizard. Then there are other companies, but those are the four principal outlets of distribution.

662 Q. Are these washing machines which the Solar Corporation manufactures all automatic washing machines?

A. No, automatic and wringer washers.

Q. And of the automatic types, do you make them under several different labels?

A. That is right. It is primarily under the customer's label.

Q. Just roughly what is the proportion, relatively, of automatic and wringer types that you make?

A. Currently it is running about 60 per cent automatic and 40 per cent wringer washers.

Q. You know that in this lawsuit, Mr. Castner, we are concerned with the so-called sediment trap feature. You are familiar with that detail of the washing machine structure, are you not?

A. Yes, sir.

Q. You do not have any such feature in the so-called wringer types of washing machines, do you?

A. No, sir.

Q. Now of the automatic washing machines that the Solar Corporation makes, are they all substantially the same?

A. The basic construction is identical.

663 Q. Do they all have sediment traps of some kind in them?

A. Yes, sir.

Q. Is the washing part of the machine, distinguishing the bowl and the operating transmission and mechanism as apart from the casing, is that the same in all of the automatic machines made by the Solar Corporation?

A. It is practically identical, yes, sir.

Q. And what type of sediment trap do you put on the automatic washing machines made by the Solar Corporation?

A. We have the sediment trap that is covered in the patent at issue here. There is one variation in that on the cheaper low end models, we do not put the ejector tube on it, primarily to give us a step-up story, a sales story between the models.

Q. Now you mentioned that you had a sediment trap in each of the automatic washing machines made by the Solar Corporation, but there was a modification in one type of structure in which you did not have the discharge tube, is that correct?

A. That is correct.

Q. Well, where does the sediment trap in that
664 type of washing machine discharge?

A. It does not discharge. It has an overlapping lip, the same as on the other machines, and any heavy soil will accumulate under there, but it would have to be removed manually rather than automatically such as with the use of the discharge tube.

Q. Is that the lowest priced of the automatic machines which you distribute?

A. Yes, sir.

Q. And that is the only variation in the automatic machines with respect to sediment traps?

A. That is correct.

Q. Now the sediment trap itself in the machines which

the Solar Corporation manufactures consists of an annular trough at the bottom of the washing bowl, does it not?

A. That is correct.

Q. And is that a concentric trap or has it eccentricities built into it?

A. It is concentric.

Q. I note that in the drawings of the Castner patent, with which you are undoubtedly familiar, Reissue No. 23,626, you show a sediment trap with an eccentric trough, not a concentric one.

665 A. I might say that we have used it both ways, put it that way.

Q. What are you doing currently?

A. I cannot tell you at this time; I would have to check the drawings to give you the exact information on that at the present time.

Q. You don't have those with you, do you?

A. No, sir, I do not.

Q. Would it be agreeable to you to furnish copies to us of those drawings through your counsel, and if there are different types, we would like a drawing of each specimen?

A. Very well.

Mr. Ooms: Do you see any objection to that, Mr. Carlsen?

Mr. Carlsen: I see no objection to it.

The Witness: I would be glad to get them for you.

By Mr. Ooms:

Q. Am I correct, Mr. Castner, that in all of the automatic washing machines which you equip with a complete sediment trap, you use the structure shown in the Castner patent and not that shown in the Roth patent where

666 the discharge is on a tangent from the sediment trap, is that correct?

A. No, that is not correct. We are using both systems, and right at the moment here, and since the first of the year, I would have to check to verify whether that is still the Roth ejector, so-called ejector type, or whether it is straight. We changed our system of valancing, and the tube comes in there a little different.

Q. Well, you made a change at the first of 1955?

A. Yes, sir, on our '55 models, we changed our system of balancing and the tube became a factor, then, as to bringing it up at an angle, and I think it is up vertical on the present construction.

Q. Your impression is that on the current '55 models, you have gone back to the Castner construction rather than to the Roth construction?

A. In relation to the angle of the tube. Now I would want to verify that, though, to make sure.

Q. Well, we are not trying to get anything but the facts, Mr. Castner, and I am perfectly agreeable if you can give us a letter with the history of that, so that we may know what changes they have gone through in the trap since the issuance of the Castner patent in 1949.

667 A. They are very simple answers that you have asked for, but not knowing just what information you wanted—I could have brought drawings, and we could have pinned down some of the details a little bit.

Q. You can do it equally well by having Mr. Carlsen send us the print and tell us over what period you used the different types since the issuance of the Castner patent on May 17, 1949.

A. Yes, sir.

Q. Do you recall, Mr. Castner, whether you were in 1949 building automatic washing means?

A. Yes, we were.

Q. At the Solar Corporation?

A. Yes, sir, we were.

Q. And were you equipping those with a sediment trap?

A. Yes, sir.

Q. Do you recall now whether that was the Castner type or the Roth type?

A. I think it was what you referred to as the Castner type with a vertical tube, that would have to be verified, if it is significant as to the date; I don't know.

668 Q. If we could merely get a drawing of each of the types you have used since the issuance of the Castner patent, each of the different types, and the time when you changed from one to another, that would be enough for our purposes.

Now you mentioned that on this low priced line, the discharge from the sediment trap was not tubed out, but was apparently closed up.

What proportion of your output currently is in that low priced line of automatic washing machines?

A. I would say just as an estimate that it would be about 30 per cent. Last year it wasn't much over 15 per cent.

Q. Was there a specific date in the history of these machines when you began to make the device with the sediment trap without an outlet?

A. I think the record would show that, yes.

Q. I wonder if we could have that figure, too, from Mr. Carlsen?

All we are looking for is information, and the easiest way for us and for your counsel and you would be not to pursue these things where you don't have the data,

669 but if you are agreeable to it, have you furnish it

to us informally. We have great confidence in Mr. Carlsen and great confidence in you, and we are willing to take his letter on that kind of material, if that is agreeable to you.

A. It is all right with me. I have confidence in Mr. Carlsen and whatever he says.

Q. Do you recall about when you began to make this low priced machine?

A. Let's see. I think it was about the first of January, '54; it might have been a little before that.

Q. And last year your present estimate is that it was about 15 per cent of your automatic output?

A. That is correct.

Q. And this year it looks like about 30 per cent?

A. That is correct.

Q. And you are proceeding to market that device in your regular marketing program?

A. That is right.

Q. Now, Mr. Castner, the complaint in this case alleges that the "plaintiff has invested large sums of money in developing and putting into practical use the inventions covered by the aforesaid patents—" which would be the Castner and Roth patents.

670 Now I am not inquiring at this time into the exact date when either you or Mr. Roth made your invention. I think that is going to disappear as a critical matter here, but I would like, without inquiring into that specific thing, to get something of the history of this development of the Castner invention.

Do you recall when you first put it on washing machines?

A. Well, in reviewing a few things with Andy yesterday, I see the patent was filed in December 1945.

Isn't that correct, Andy?

Mr. Carlsen: Yes.

Mr. Ooms: That is correct.

The Witness: And just how much time went ahead of that in the orignal design and working models, I don't know. I think it is probably a year or so, but that would be subject to verification, too.

By Mr. Ooms:

Q. Who did that work, the Solar Corporation?

A. That is correct.

Q. And you were connected with the company at that time?

A. Oh, yes.

671 Q. Did you make many prototypes before you brought out a commercial washing machine with the sediment trap in it?

A. Well, our first production, to my recollection, was in the early part of '47. We had working models made up probably a year prior to that, or longer, and of course the experimental work, like I indicated, might have covered a period of a year or more prior to the filing of the application.

Q. Well, of course at the time the application was filed, December 21, 1945, we were just coming out of the war, and you hadn't been making any washing machines in 1945, had you?

A. That is correct.

Q. Do you know how soon after the end of the war you did get into the manufacture of automatic washing machines?

A. Like I mentioned before, my recollection is the early part of '47.

Q. Well, that was the actual beginning of washing ma-

chine manufacture, and not merely the provision of the sediment trap. In other words, that was when you started to make automatic washing machines?

A. That is correct.

672 Q. And from the first you equipped them with the sediment trap?

A. That is correct.

Q. And the sediment trap, as you recall it now, at that time was of the Castner type?

A. Yes, sir.

Q. Who is Mr. Walter J. Roth?

A. Walter Roth is an engineer that was formerly with the Alliance Manufacturing Company at Alliance, Ohio. That company is or was a division of the Dexter Company, with headquarters in Fairfield. He has been with us since. I think he started three years ago the first of January, which would be January 1, 1952, and he actually acts in the capacity of chief production engineer.

Q. He is still employed with the Solar Corporation?

A. That is correct.

Q. And when you state that he was formerly employed by Dexter, is that the Dexter Company that makes the Easy washing machine?

A. Offhand, I am not familiar with that Easy washing machine. Dexter had been bought out by Philco here some two years or more back.

Q. But Mr. Roth came to you with some washing
673 machine experience, did he not?

A. Yes, sir.

Q. And do you know whether at the time he came with you, he had this sediment trap design of his manufactured, or did he develop that while he was with the Solar Corporation?

A. As far as I know, it was developed entirely since he joined Solar.

Q. When you began the manufacture of washing machines, approximately January 1, 1947, were all of the machines that you built and sold fitted with the sediment trap we have been discussing?

A. As far as my recollection is concerned, we installed that sediment trap on all of them.

Q. But in addition to the machines that are made by the Solar Corporation, the Solar Corporation has licensed some washing machine manufacturers to operate under the Castner and Roth and other patents, has it not?

A. Yes, sir.

Q. Who are those licensees?

A. The Hotpoint Company of Chicago, a division of General Electric; the Speed Queen Company of Ripon, Wisconsin; the Easy Company of Syracuse, New York;
674 and there is a company in Australia, the Simpson Company. Those are the active licensees at this time.

Q. Let us take those one at a time.

Was the Hotpoint Company of Chicago manufacturing an automatic washing machine at the time you issued them a license?

A. To my knowledge they had not manufactured it. They, I think, were selling some automatic washers; or they could have been through the General Electric affiliate, the company that they are affiliated with, but I am not sure. My recollection isn't too good on that.

Q. Do you recall when they took the license from Solar Corporation?

The Witness: Andy, do you have those dates so that I don't have to guess?

Mr. Carlsen: The date of the original agreement with Hotpoint is July 14, 1948, and it was amended in latter form on November 28, 1950.

By Mr. Ooms:

Q. Do you know which of the two types of sediment traps Hotpoint had built into its washing machine?

675 A. Originally my recollection is that they followed our identical construction on this as far as the sediment trap was concerned.

Q. Didn't they practically make a duplicate of the machine you were building in '47?

A. That is right, they started off, to facilitate getting into the manufacture, as I understood it, and so they didn't introduce new engineering problems, and all that, they followed very closely the design, the basic design of the mechanism.

Q. Did you furnish any parts for that when they first started to manufacture the Hotpoint washing machine?

A. I don't think we supplied any parts directly; we authorized in that arrangement some of our sources to use tooling and dies of ours to help them get under way.

Q. In other words, they could take the tools to manufacturers of their own selection and have the parts made from your tools?

A. It wasn't quite that broad. It depended on whether such tooling had a capacity to take care of us and take care of them.

Q. In other words, some of the parts you were

676 getting were being made with your tools on the outside?

A. That is right.

Q. And to the extent that that outside manufacturer had capacity, he was permitted to sell parts from the same tools to Hotpoint, was that the arrangement?

A. That was about the way it was, yes, sir.

Q. And to what parts of the machine did that apply? Was it more than the sediment trap?

A. No, that applied to most of the major castings, including the sediment trap, and it applied also to the tubs to the Alliance Ware Company, and in our basic design at that time, the splash tub was a basic part of the cabinet, and they worked out this arrangement with Alliance Ware to supply them with splash tub cabinets, spin tubs, and they have had some modifications on the design of that splash tub as it affected the cabinet styling.

I think shortly after they got under way, they lined up on their own with the Ingersoll Steel Company, a division of the Borg-Warner Company.

Q. How long did that arrangement continue where they bought parts made from your tools, do you recall that, Mr. Castner?

677 A. It was my recollection it was about eighteen months, because they told us at the time that they were immediately putting people on the drafting board to redesign the whole machine style, keeping our basic construction, but getting on their own completely as relates to manufacture.

Q. And have they made a substantial modification of their design since '48?

A. Their basic design is still pretty much the same. They have wavered some as relates to the sediment trap in that they have taken it off and put it back on and have had some modifications of it.

Q. Was there any particular reason for that change with respect to the sediment trap?

A. Well, from what knowledge I have, it tunes in with a policy laid down by Mr. Sharp, who is now president of

Hotpoint, and originally when we got in these negotiations, he was vice-president in charge of engineering, and at that time that he signed up, why he told us frankly that "We are paying you a substantial sum of money for this engineering help and all that, in addition to royalties," and he said,

"If we get into it, we are going to make fifty or one
678 hundred thousand units, and that means that the royalties are substantial. To put it bluntly," he said, "I would slit a guy's throat for $10,000, and this sum runs way beyond that. So you figure what we are going to do to circumvent and get out of this patent structure."

That was the statement he made at the time, so their overall policy ever since then has been that any engineer in there, from all of the knowledge I have, and they frankly admitted it, is to get out from under this Solar patent structure.

Q. You mentioned that they paid you for engineering; that was separately from royalties?

A. That is correct.

Q. And they also paid you for other features than the sediment trap, did they not, as royalties?

A. Yes, sir.

Q. And I understand, do I, that they had licenses under several patents other than the Castner and Roth patents?

A. At the time we entered into that agreement, there were no patents, as such; they were simply applications.

Q. But they did take licenses from Solar Corpo-
679 ration to manufacture other features than merely a sediment trap?

A. That is correct.

Q. Was that true of your other licenses also, that they all included other features than the sediment trap?

A. Yes, sir, with one possible exception, and that was the Dexter.

Q. The Dexter license, you say that did not cover the other features?

A. It was open for one feature, and that was a temporary arrangement, where the licensees that I gave you were, as I stated, the ones that are active at this time; there were two other licensees that never got into production.

Q. And which were they, Dexter—

A. Dexter.

Q. And what was the other?

A. Philco.

Q. And neither Dexter nor Philco has a license from Solar Corporation at this time under any patents?

A. That is correct, and they all, except that Dexter, took in more than one feature such as the sediment trap.

680

Q. Well, now, let us return to Hotpoint. You stated that they had made changes from time to time in this sediment trap arrangement. Are they using it at the present time?

A. The machine that I looked at during the Furniture Show in January did not have the sediment trap on it as covered in our patent structure—at least that was my observation from just pulling out the agitator and looking in there.

Q. They still have a license from Solar Corporation?

A. That is correct.

Q. Do they use some of your other features at this time that are covered by other patents, other than the sediment trap patents?

A. Yes, sir.

Q. Are they in the current Hotpoint machine?

A. Yes, sir.

Q. They relate to transmission features, do they not?

A. Nothing in the transmission is covered by any patent.

Q. Maybe I used the wrong terminology in your field. I am not interested in details, or anything, but do
681 they relate to the drive mechanism?

A. The drive mechanism, such as the fluid drive and the method of snubbing.

Q. Is that snubbing during the operation to prevent the machine from vibrating?

A. Correct, during the spin operation.

Q. Now you mentioned that Hotpoint had wavered from time to time on this sediment trap feature before January 1st of this year. What changes did they make from time to time that were of any consequence?

A. They do not confide to us, I think, due to the overall policy that I refer to that Jack Sharp laid down, and the only thing I can tell you is the comments that I have heard from some of them and hearsay. During 1950, '51, I think, during the Korean War, they took the sediment tube off. They left the casting, as I recall it, of the same sort, it had the overhanging lip and the annular recess, and the story they gave us at the time was that aluminum was so scarce, that by eliminating that tube, they were able to stretch out their total overall production.

Then they put it back on again, and it is my
682 recollection they had some modification where they put a rubber in there, none of which made any sense to me, because it all tied in with what I thought was this overall policy that Jack Sharp had laid down, and they did many things on their design that didn't make sense, but it looked like it all tied in with that overall idea to get out from under.

Q. Well, it did affect their royalty obligations when they cut off the sediment trap, didn't it?

A. No, sir, it did not.

Q. It did not?

A. No, sir, they still paid the full amount of royalty.

Mr. Ooms: I am going to ask for an opportunity to examine the Hotpoint license and to make copies of those portions of it that deal with this subject.

We are not curious about your business arrangements, except as they affect this lawsuit, and I wonder what the position of your counsel is going to be on that? Can we work that out while you are here?

683 Mr. Carlsen: The position, Mr. Ooms, is the same as it has been in the past, and I have offered on previous occasions to provide copies of the licenses to Mr. Stallings. We will be glad to provide full copies of all of our current existing license agreements to you. We have no reason for withholding any of them or any provisions in them.

Mr. Ooms: Could they be made available while you are here, if we can get a photostater to run them off, or would you prefer to do that back in Minneapolis?

Mr. Carlsen: I would prefer to do it in Minneapolis, if it doesn't make any difference to you. As a matter of fact, we already have some photostatic negatives of some of them, but I didn't get them completed before I left. I will be glad to furnish them to you.

Mr. Ooms: While you are here, maybe we can run over them a minute, to see if there are any questions that we want to ask Mr. Castner about them before he leaves.

Mr. Carlsen: You can do that right now if you want to.

684 Mr. Ooms: Let's see the Hotpoint license.

(A brief recess was here taken.)

By Mr. Ooms:

Q. Mr. Castner, your counsel has been kind enough to hand us a copy of the Hotpoint license, and I note that it has a provision in Paragraph 2 that it would be exclusive until January 1954.

Do I understand that the other licenses have been issued after that date, or was some change made in that exclusive arrangement?

A. There was a change made in the exclusive arrangement.

Q. And the licenses to Easy and to Speed Queen were executed some time before January 1, 1954?

A. That is correct. Yes, that would be right, but after the exclusive feature had been eliminated from the Hotpoint license.

Mr. Ooms: May we look at the Easy or the Speed Queen, either one, whichever is handy?

Mr. Carlsen: The next one in order is the Speed Queen agreement of November 30, 1951, of which I hand you the original copy, Mr. Ooms.

685 By Mr. Ooms:

Q. Counsel has handed me the agreement between Beam Manufacturing Company and Speed Queen Corporation of November 30, 1951.

Had Speed Queen been manufacturing an automatic washing machine before that date?

A. Yes, sir.

Q. Did they continue to manufacture their own design or did they take on the design of Solar Corporation when you granted this license?

A. My recollection is that at the time they took that license, they had abandoned the manufacture of another de-

sign, and since they have taken on our license, as far as I know, the only ones they have made have been in accordance with our basic design.

Q. Did they have any arrangement similar to that of Hotpoint with respect to the purchase of parts from your suppliers?

A. No, sir. The only arrangement that they had, there were a few parts, and I remember one item was one part of the fluid drive, an aluminum casting, and I think another pump part, and it is my recollection that on those two or three items, they got off; they paid us an amortiza-
686 tion charge or some kind of a charge for the use of that, and that was separate and apart from the royalties.

Q. Did they also pay you separately for the design of the machine, or did that go with the royalty license?

A. With the royalty license. We gave them sets of drawings and some information.

Now they did not use that to any extent. I don't think they have any parts in their machine, or very many, at least, that are interchangeable with ours. They built it around their own transmission, so that practically all dimensions are different, and it completely eliminates much chance of interchangeability.

Q. They do use the hydraulic drives and the snubber arrangement which you designed, do they not?

A. Yes, sir.

Q. And they also use a sediment trap. What kind of a sediment trap do they use?

A. As far as I know, they have continued to use the original design of sediment trap such as we were using in '51.

Q. That would be the Castner type with the fluid or the

sediment discharge outlet, the vertical tube dis-
687 charging from the side of the trap itself?

A. I couldn't tell you that for sure, Mr. Ooms.

Q. You don't know whether they have ever gone to the tangential discharge of the Roth design?

A. No, sir. It is my recollection that they haven't, but it is not based upon accurate information.

Q. Did Hotpoint ever go to the tangential discharge of sediment?

A. Not to my knowledge.

Q. Do you know what arrangement Hotpoint has in its current machines for taking care of the sediment?

A. It seems to me that they got an irregular shaped recess in there that is part of the tub, and I don't remember if it is on this model or last year's, but they had a couple of rubber plugs that just looked silly. I don't know why they have gone to this at all except in that overall picture, and, incidentally, in answer to the question before about what differences there are, they are also trying to work out a fluid drive. They have a slip clutch or friction clutch on their low end washer this year.

Q. But their standard model and last year's model had your fluid power drive, your fluid drive and your
688 snubber arrangement?

A. That is correct, but it is just part of that overall pattern that Jack Sharp made out, as far as we can see.

Q. Do you know whether or not the Speed Queen Corporation, since they took this license in 1951, have made any changes in their design of the sediment ejector?

A. Not to my knowledge.

Q. Do you know whether they have a sediment trap on the current model?

A. As far as I know, they have on all of their models.

Mr. Ooms: May I see the license to Easy?

Mr. Carlsen: The agreement with Easy, Mr. Ooms, involves two documents, one of which is a license agreement dated October 27, 1952, and the other is a so-called technical assistance agreement also dated October 27, 1952. I hand you signed copies of both of these documents.

By Mr. Ooms:

Q. Concerning the Easy Washing Machine Corporation, your licensee, Mr. Castner, did they manu-
689 facture an automatic washing machine before they took their license in October 1952?

A. Not to my knowledge. They had a development of their own on which they had spent a lot of money. They showed me the working model of it, but they were afraid to put it in production because of apparent shortcomings in it.

Q. And when they did take the license from Solar Corporation, they also entered into, as counsel pointed out, this technical assistance agreement to have the advantage of the designs which Solar Corporation had worked out in their automatic washing machine, is that correct?

A. That is right, it took in engineering help.

Q. And when they built a washing machine under this license, was it one that was in many respects comparable to the machine that the Solar Corporation was building?

A. The basic mechanism of the machine was almost identical.

Q. Have they continued to manufacture that machine up to this time?

A. As far as I know, that is the only one they had made.

690 Q. They used a number of the features which

you had developed and had incorporated into your machine, didn't they?

A. That is right.

Q. Do you know what provision they had for a sediment trap in the machine they built?

A. As far as I know, it is identical to what we have been using.

Q. The Castner type or the Roth type?

A. I couldn't tell you now what they have done. It is open to them to use either one, and I haven't kept up with some of the things they have done. Ordinarily these licensees like to develop some special individual features that they don't come back to us about all of them, and the only way we can find out normally is to look at their machines on the market.

Q. You mentioned something that I was going to get into later, and that is that all of these manufacturers like to develop individual features as a merchandising device, do they not?

A. That is correct.

Q. They like to have something they can point to as being exclusive with their machine?

691 A. That is right.

Q. And that is part of the merchandising practice which enriches the variety of machines we get, isn't that right?

A. Yes, sir.

Q. I don't deprecate it, I think it is a great thing for business, but that is a fact that anybody who builds machinery contends with. In fact, you doubtless redesign your machine from year to year, do you not?

A. We try to get other features that the salesmen can blow up, and for the advertising department to work on.

Q. Anything that will improve the machine and that you can call to the attention of the customer is worth putting on the machine, isn't it?

A. That is right.

Q. Mr. Castner, in your complaint in this case, you have stated that all of these washing machines made and sold by Solar Corporation under the patents in suit have been marked with notice of the patents.

What markings do you put on the machine?

A. I think we are using a decal. It is on the machine adjoining the name plate.

692 Q. Could we get a copy of that through your counsel?

A. Yes, sir.

Q. What do your licensees do with respect to marking under the patents under which the Solar Corporation has licensed them?

A. Well, I think it provides in the agreements that they mark them.

Doesn't it, Andy?

So far as I know the markings should be on.

Q. You are not familiar with their actual practices?

A. Offhand, I couldn't tell you exactly.

Q. Do you know whether they are required to report to you the type of marking they will employ on the machine?

A. I don't think that is a requirement in the license agreement to report to us exactly what they are putting on, but it is my recollection that they should show the patent numbers in some manner.

Q. You mentioned that there had been two other temporary or proposed licenses under which the licensees had never manufactured. Were those both limited to

693 merely sediment traps or did those licenses include the other features which you have been licensing to Hotpoint, Speed Queen and Easy?

A. The Philco deal was a complete lineup of the whole patent structure. The Dexter deal was an unusual arrangement in that we were working together, presumably, to do a joint tooling, and in that deal it was open to them to use one basic feature which defines the sediment trap and the fluid drive and the snubbing arrangement.

Q. But that did not work out, as I understand it?

A. That is right, it never resulted in production for a lot of detailed reasons.

Q. Are they making a machine at this time?

A. No, sir. We are still selling them some machines.

Q. Now, Mr. Castner, your complaint alleges that you have, prior to the commencement of this suit, notified Borg-Warner Corporation of the infringement of each of the two patents in suit.

Do you know what form that notice took?

A. I have a recollection that that originated at the time when Borg-Warner Company first got into production.

694 I wrote to Mr. Ardis to get a machine, and I wrote him back shortly after that that I did observe that they had a sediment trap on which we either had a patent issued or had one pending, and it looked like it overlapped, and at that time I suggested that maybe they might have some features that we might interchange. I don't recall that.

Q. And you subsequently had some conversations with the Borg-Warner Corporation about it, did you not?

A. That is right.

Q. Do you recall when those meetings were held at which you discussed this question at the Borg-Warner Corporation?

A. Well, I think the first formal meeting took place in Mr. Stallings' office when Andy and I visited your office.

Q. Is that the June 26, 1952, meeting?

A. It is my recollection—

Mr. Carlsen: June what?

Mr. Ooms: June 26, 1952.

Mr. Carlsen: Well, I don't recall. I don't have those dates. As a matter of fact, I don't have any correspondence from that time.

695 The Witness: What time did you get into production, Carl, do you recall?

Mr. Stallings: I don't remember.

Mr. Ooms: It is in here somewhere.

The Witness: You are talking about dates, and on something like this, we have got them in the file, but we just don't happen to have a lot of that information here.

By Mr. Ooms:

Q. Well, there have been only two meetings, haven't there, at the Borg-Warner Corporation?

Mr. Carlsen: I am not even sure of that. I think there were three, but there might have been only two.

Mr. Ooms: I am not trying to ensnare anybody or anything, I just wanted to develop what occurred at those meetings as you recall it.

By Mr. Ooms:

Q. Did you go there at the invitation of Borg-Warner, or had you solicited the meeting?

A. It is my recollection that I had some conversation with somebody, maybe with Ardis, the manager of the Herron plant, and it was delayed quite a few times,

696 and then finally it culminated in that first meeting in Mr. Stallings' office.

Q. In the interrogatories which plaintiff has addressed

to us, there is reference to a conference on June 26, 1952, at the defendant's offices in Chicago. Do you recall who was at that meeting?

A. I am pretty sure that Andy Carlsen accompanied me and we met with Mr. Stallings, and I think Mr. Gartner was present, and possibly Mr. Motley.

Q. Do you recall what was discussed at that meeting?

A. Yes, sir. What was discussed was the problem at hand, that we felt that we had a case, pretty much of a closed case on this sediment trap, and that we had very friendly relations with the Borg-Warner Division of the Ingersoll Steel Company, and we hated to see any litigation or anything develop, but our hands were pretty much tied because of the recognition of these patents by others in the industry, and the royalties that we had; so that, in spite of our desire not to embark upon anything that would lead to such litigation, why, we felt that we had no alternative, if we couldn't work out something with them in the form of a license or something so that we would be clean with our other licensees.

697 Q. Did you have a formal proposal to submit to them at that time?

A. We would have been happy to submit a formal proposal, but we never got by the basic features of what the deal would consist of. They were so far apart on the payment of a royalty that would come within the structure of our licenses—we explained the meat of what our license deals were to them, that it was a one per cent deal if they took two or more patents, or half of that figure if they took just the one patent, just as covered by the sediment trap, and it was on a sliding scale, ultimately coming down to three-tenths of one per cent of their factory billing price.

But we never got close enough on the ideas of what would be a royalty to get down to submit a formal deal.

Q. At that time you did have and had for three years the Castner patent, and that was the only patent and feature that was discussed at that time, was it not?

A. Yes, sir, I think it was.

Q. At that meeting did you make any disclosure to them at all of the Roth design?

698 A. I don't know at what meeting, but eventually there were two or three meetings, and I think eventually, to my recollection, it was disclosed, but just at what time along the line, I do not know.

Q. Well, whatever meeting it was at, I believe it was the next one—isn't this the way it happened, that Borg-Warner pointed out to you that they were about to change the design to avoid this controversy and told you what the design was?

A. That is correct, at one of those meetings Mr. Stallings, Gartner, or one of the boys brought in a revised design which they felt evaded the patent, but Andy and I frankly stated that it still is within the scope of the claims of that original Castner patent, at least it looked like that to us, and we so stated.

Q. Well, what was that modified design, do you recall?

A. As I recall it, they brought their escape from the annular recess off at a tangent rather than at a right angle, which we didn't feel made any difference, particularly in view of one or more of the claims of the original

699 Castner patent, that it was broad enough to cover anything, and that was our feeling, and we so expressed ourselves.

Q. Didn't you also at that meeting for the first time then disclose that you had the Roth application pending?

A. I think we told them that there was another application that might have a bearing on the situation.

Q. But they actually disclosed the modified design to you before you brought to their attention the fact that you had the Roth patent pending?

A. I can't answer that, Mr. Ooms. It is my recollection that we had the Roth design developed and in the works, in the process of patenting.

Q. My question wasn't that. I am convinced, Mr. Castner, that you are correct, that you did have it on file, but you had made no disclosure of it to Borg-Warner Corporation until the men at one of those conferences disclosed to you the proposed modification of their design, isn't that correct?

A. That could be correct. I don't remember what the sequence was on that.

Q. But you had no machines in the field at that time that had the Roth type of sediment trap on, did you?

700 A. I think that is a correct statement, according to my recollection.

Q. Now at no time, am I correct, did you give Borg-Warner Corporation either a draft license agreement or any formal proposal, it was all a discussion?

A. That is right. I outlined all of the salient features of the contract, and it is my recollection that Mr. Stallings or Mr. Motley or one of the boys wrote down those salient features as I had previously outlined.

Q. And that included that you were willing to license under any of your patents, but if they took the sediment trap feature alone, they had one royalty rate, and if they took the hydraulic drive with it, they had a higher royalty rate, and if they took the snubber feature, they had still a third rate, is that correct?

A. No, sir.

Q. Will you tell me what your understanding of it was?

A. Well, I think our copies of these license agreements will bear out that one feature is one-half of the other
701 rate, and the other rate takes in two or more patent features.

Q. There are only two rates, then?

A. Only two rates.

Q. And all of your licensees that are at present operating under your license in the United States are operating on the higher royalty rate with the group of features?

A. That is correct.

Q. And all tenders of license that you have made have had that characteristic, that one could take the sediment trap alone at one rate, or the hydraulic drive alone at one rate, but if you took two or more features, you had a different and higher rate, but not twice as high?

A. Yes, it is twice as high as the single feature.

Q. Oh, it is twice as high, but it does permit you to use two or more features if you choose to pay the higher rate?

A. That is correct.

Q. Do you recall whether any of the licensees that are making the sediment trap at the present time are making that sediment trap in the form of an eccentric trough at the bottom of the bowl as distinguished from a purely concentric one?

702 A. No, I do not. I think Easy are using the identical design; however, if Speed Queen got into some modifications, I don't know.

Of course, you have got that Hotpoint that we discussed, they have done so many unusual things, and they have not followed our recommendations there on the size of the tube

or the opening, and so they jammed up; but, as I say, they have done a lot of things we haven't thought are right, but they went on their own in view of that overall policy of Jack Sharp's.

Q. Have the other licensees pretty much adhered to the original designs you delivered to them of the sediment trap?

A. That is correct, although they have had the opportunity to work into any design that is covered by the Roth patent.

Q. You explained and used a term which I am trying to recall of describing the lip at the bottom of your bowl where the fluid can enter into this sediment trap. Did you use some phrase like "lip" with respect to that?

A. Yes, an overhanging lip, so that when the water starts to swirl when the tub is spun, it will entrap
703 that heavy soil and carry it to the outer diameter of that annular recess and permit it to escape out of the opening for the tube.

Q. And do all of your licensees make it with that overhanging lip?

A. As far as I know, they do. If they didn't have the overhanging lip, why, the heavy soil might just slide out over the top and destroy the effectiveness.

Q. I am looking at your patent drawings here, Mr. Castner, and I wonder, just so I am clear with respect to this, is the overhanging lip that you have described—is the lip 30, or is the lip 27 that you speak of?

A. Let's see. It looks like it is 30.

Is that the lip there? We had originally a casting that recessed into the tub, and I think it is this casting right here (indicating) that formed that overhanging lip.

Mr. Carlsen: Well, that is marked 30.

The Witness: Is that marked 30, the casting, or is it 29?

Mr. Carlsen: It is 30.

704 The Witness: Well, this is it right here, and that is in the form of a casting that overhung there (indicating).

Mr. Stallings: For the purpose of the record, what patent are you pointing that out on?

The Witness: The Castner patent.

Mr. Ooms: Castner Patent 2,470,140, and the same drawings appear in the Reissue Patent 23,626.

By Mr. Ooms:

Q. And you state that this lip 30, as shown in these drawings, is important to prevent the liquid, when you begin to spin, to discharge, from climbing back up the bowl and into the clothing, is that correct?

A. Yes, sir. Not only the liquid, but the heavy soil that you are primarily concerned with, rather than the liquid. The liquid is, of course, the vehicle that washes away the heavy soil, but you do get both the heavy soil and the liquid that is entrapped by that overhanging lip.

Q. We were asked in your interrogatories, Mr. Castner, whether the sediment trap and discharge tube which Borg-Warner has put into its second type of construction,

705 the tangential discharge, was any more efficient than that in the first construction where we had an eccentric trough with a directly lateral discharge and a purely vertical tube.

Have you ever made any tests to test the relative efficiency of those two types of machines with respect to the sediment trap only?

A. I don't recall that we ever made any tests that way to measure it. They are both effective, practically the same. I think there isn't a great deal of difference.

Q. Is there any difference you could observe without running tests, merely by operating the machine?

A. I don't think you could observe anything. Maybe if you had a transparent tub, you might be able to see how that water was ejected.

Q. We hadn't made any tests, you know, and I wondered whether you had, and what your results were, so that we could save some work, probably, by using your experience in that field.

A. Well, I think the more you tend toward a tangent, why, the more chance you have got for the help of inertia, in addition to centrifugal force, probably. That would be an offhand guess at the thing.

706 Q. That is the principle which is incorporated in that Roth structure, is it not, that by having the tube trail, you get the advantage of having the drag or inertia of the liquid in the tube and the solid in the trap and tube to assist lifting it out?

A. That is right, and I think I told Carl and the boys there at the meeting that that is what I thought would result, and if it was possible for their design to come forth with any patent claims that might be considered a refinement on the basic idea of our sediment trap, still our claims in our patent were still broad enough to cover anything, even any little refinement they might come up with.

Q. I note in the drawings in your Patent No. 2,470,140, you have Figs. 2 and 3 which show a sediment trap with a centrifugal valve mounted on it.

Have you ever built machines of that type, Mr. Castner?

A. We have never put machines of that type in production. I think we made up a couple crude samples, working samples of that, but our opinion was that your tube was so much simpler, foolproof, and apparently cheaper, and so

we went to that, and that is the only type we put into production.

707 The other design there, your other design there with spring tension and the weight might be subject to some lint or strings or something getting jammed in it and preventing it from closing, whereas the tube completely eliminates that possibility.

Q. None of your licensees use the centrifugally weighted valve, do they?

A. No, sir, not that I know of or ever heard of.

Q. Mr. Castner, you filed in the United States Patent Office an affidavit when you surrendered your original Patent No. 2,470,140, and filed your application which resulted in the Reissue Patent No. 23,626.

Do you recall filing such an affidavit?

A. Yes, sir, I have a recollection of that.

Q. I call your attention to the file wrapper and contents of the Reissue patent.

On pages 17, 18, 19 and 20, I will ask you if you would examine that affidavit a moment, and I want to ask you a few questions about it.

A. Yes, sir, I have read it.

Q. Have you had an opportunity, Mr. Castner, to read the affidavit which you filed with the Patent Office in support of your Reissue application?

708 A. Yes, sir, I quickly ran through it.

Q. I note you state that the specifications of your patent which was reissued, No. 2,470,140, is defective and insufficient, and you point out there, I believe, a single paragraph which was inserted into your Reissue as correcting that insufficiency.

Now what was the defect of this original specification?

A. Well, that is something that I relied completely on

Mr. Carlsen there for the wording and the phraseology of that, and after—I think that whole thing originated from the fact that we had the Roth application in, and they uncovered this Dunham patent, and Andy pointed that out, with the idea that we should get a Reissue so that we would have covered the Dunham patent as well in the claims that were finally allowed in the Reissue.

Now as to that terminology in there, and all that, why, you are talking—you are getting into a patent attorney's—

Mr. Carlsen: You say "covered the Dunham patent." What do you mean by that?

The Witness: Well, I meant that any claims in the 709 Dunham patent that might have interfered—I don't know if my terminology is right, that is why I have to lean on Andy, but anyway the Dunham patent wasn't covered and raised some question that Andy thought made it advisable to have the Reissue, and the terminology that he used describing "defective" and all that, I think is purely legal terms on which I am not qualified to give you a very definite answer.

By Mr. Ooms:

Q. Mr. Castner, I am going to show you the drawings of the Dunham Patent 2,274,402, and ask you if it is your recollection that that is the Dunham patent that you referred to?

A. I couldn't tell you at this date. Maybe it is identified in there (indicating).

Q. Yes, it is.

A. 2,274,402. That apparently is the patent.

Q. Now, Mr. Castner, in the addition which you made to the specification which appears in Column 3 and lines 56 to 61 of the Reissue patent, you state:

"Inasmuch as the sediment trap 28 is annular in

form and extends entirely around the base plate.
710 under and concentric with the agitator skirt, it will be seen that all areas of the dished bottom part 14 of the tub will drain freely and directly into the trap."

As a matter of fact, the only trap you show in the drawings in your Patent 2,470,140, is not concentric with the agitator skirt, is it?

A. Substantially the same.

Q. You do observe that there is some eccentricity in the trough, do you not?

A. I think that is one design that has been used. Let's see that.

Q. Go right ahead, sir.

A. Yes, that drawing shows slightly eccentric, but it is substantially concentric.

Q. You were using the term, then, in fact, that it was a complete annulus, and not merely a portion, is that it?

A. That is right, particularly in contrast to the disclosure of Dunham which had the tubes on all of their openings, as I recall it.

Q. The Dunham patent did show sediment traps at the bottom of the bowl, did it not?

A. Yes, off to the side, and nothing that was completely annular, according to my recollection.

711 Q. Do you recall where you first heard of that Dunham patent that is referred to in your affidavit, Patent No. 2,274,402?

A. Well, I think it was through Mr. Carlsen, in the processing of the Roth application; he pointed out that that injected into the picture.

Q. Don't you recall its being called to your attention at one of the conferences at the Borg-Warner Corporation?

A. I have no recollection of that. To my recollection

it came entirely through the process of Mr. Carlsen.

Mr. Ooms: I think that will be all.

Do you want to ask the witness any questions?

Mr. Carlsen: I don't believe so, not at this time, as we expect to produce Mr. Castner at the trial.

Mr. Ooms: Now is it agreeable to you and to the witness, as it is to us, that we waive reading and signing?

Mr. Carlsen: That is agreeable, yes.

Mr. Ooms: And you will furnish us with the things
712 we have asked for this morning, the drawings of the various forms of sediment trap that the Solar Corporation has used on its machines, and the date when they used the various ones, to the extent your records show that, and the copies of the licenses.

That is all at our expense.

Mr. Carlsen: That is right.

Mr. Ooms: And also the decal of the markings.

Mr. Carlsen: Very well.

Mr. Ooms: Thank you very much.

(Witness excused.)"

(End of Castner deposition of April 6, 1955.)

Mr. Ooms: The defendant rests.

713 (Thereupon the plaintiff offered and introduced the following evidence in rebuttal.)

Mr. Carlsen: I will call Mr. Dugger to the witness stand.

The Court: I may suggest that you confine it now to rebuttal, confine your examination to rebuttal.

Mr. Carlsen: I propose to do that.

RALPH L. DUGGER, a witness on behalf of the plaintiff, having been heretofore duly sworn herein, being recalled, testified further as follows:

Direct Examination by Mr. Carlsen.

Q. Mr. Dugger, have you witnessed the demonstration that Mr. Waldrop has just made?

A. I did.

Q. In either one of those demonstrations could you determine when the water first started to discharge from the sediment tube or stop discharging?

A. I could not accurately.

Q. Do you have a copy of the Dunham patent?

714 A. I do.

Q. That is, the Dunham patent 2,274,402.

A. It is.

Q. Is that the same Dunham patent that was before the Examiner and of record in the file histories in the Castner reissue record and the Roth patent record, Plaintiff's Exhibits 9 and 10?

Mr. Ooms: Object to the question, the documents will show it.

The Court: He may answer.

By the Witness:

A. It is the same patent.

By Mr. Carlsen:

Q. Does the Dunham patent have anything resembling an annular sediment recess in the bottom of the tub?

A. It does not.

Q. What is the purpose of the channels 20 as shown in Figure 1 of the Dunham patent?

A. Page 1 of the specification, column 2, line 9, states this purpose as follows:

"During the washing, liquid continually overflows from the receptacle through the channels 20 and is
715 thereby withdrawn or discharged from the receptacle."

It also states in lines beginning at line 60, the last line in column 1, in that sentence which continues over into column 2—this is on page 1:

"The upper ends of the channels 20 terminate below the discharge openings 12 and define the liquid level in the receptacle."

Q. Have you read the entire Dunham specification?

A. I have.

Q. Have you found anything in that entire specification that states or even indicates there is any sediment discharged through the tubes 20 or the channels 20?

A. No. I read the entire specification, and there is not one word in it which states that any sediment is discharged through those channels.

Q. Now, will you take a look at the Dyer patent, No. 2,313,928, that is cited in the defendant's answer? Was that patent cited in any of the file histories of the patents here in suit?

A. It was not.

Q. Have you reviewed the prior art relied upon or cited by the Examiner in these various histories?

716 A. I have.

Q. And have you found any other reference that was considered by the Examiner that compares in any way to this Dyer patent No. 2,313,928?

A. Yes, there is another patent, the Dyer No. 2,392,652, which was cited in the file history of the original Castner patent and the reissue Castner patent. This patent, the second patent to Dyer, has a Figure 2, which is identical so

far as the showing is concerned with the Figure 2 of the Dyer patent No. 2,313,928. The reference characters are the same and the component parts of the illustrated apparatus are the same.

Q. Now, in both of these Dyer patents, where and how is the main body of the water in the tub discharged?

A. All of the water in the tub of the Dyer patents is run out through the bottom of the tub. None of it goes over the top of the tub.

Q. Were both of these Dyer patents assigned to the General Motors Corporation?

A. I find by examining the first page of the specification of each of these patents that they were assigned to the General Motors Corporation.

717 Q. Now, will you take a look at the King patent, No. 974,075, in evidence as Defendant's Exhibit A? Will you briefly comment on what you regard as the pertinency or relevancy of that structure as compared with the Roth patent?

A. I do not feel that it is pertinent or relevant, because it relates to an ore concentrator. Such device when in use is completely filled with the ore to be concentrated. Ores are hard materials, and it is completely filled in an ore concentrating operation.

Q. Was that patent cited in the Roth record?

A. It was not.

Q. Are there any references in the Roth application record that compare to King in so far as relevancy to this case is concerned?

A. Yes, there were other references cited which appear to be more pertinent.

Q. Will you briefly comment on them?

A. I refer to the patent to Kirby, No. 2,009,111, and

the patent to Green, No. 1,772,863. Both of these patents relate to washing machines. Each of them has the type of machine utilizing a perforated basket as the place
718 where the washing is done, a perforated basket surrounded by another container which is of the same general shape, but slightly larger, so as to contain the perforated basket, and each of these has on either the perforated basket or the imperforate container a configuration, a part of it which has the effect of taking the water up the wall of the container. Now, in the Kirby patent this element is the flange 48. Might be called—the patent calls it—

> "a connecting rib 48, which is fitted onto the exterior surface of the perforate basket."

Slants up and runs straight up the wall or side, in a direction opposite the direction of rotation.

Q. Which is the corresponding structure you can refer to in the Green patent?

A. The corresponding structure in the Green patent is shown in Figure 3, where the container on the outside, which is the imperforate container, has a channel rolled into it, the channel being 66. This is a spiral channel which spirals up the wall of the container, and is again opposite to the direction of rotation. Also in Figure 4 of the Green
719 patent there is another supplementary disclosure of a little channel fastened on the exterior container.

Mr. Carlsen: That is all of the direct examination.

Cross Examination by Mr. Ooms.

Q. Mr. Dugger, you mentioned there was a Dyer patent before the Patent Office in the prosecution of the Castner application. I believe it was patent No. 2,392,652. Do you find any reference in the specification of that patent to the sediment trap 184 at the bottom of the tub?

A. I will have to examine it.

Q. You have said it was more pertinent than the one which we have put in evidence here, haven't you?

A. No. That is not what I said. I said that the drawing of the patent, the Dyer patent 2,392,652, Figure 2, was identical so far as its disclosure with the corresponding Figure 2 of the Dyer patent, No. 2,313,928.

Q. But the specification is entirely different, isn't
720 it?

A. I have not considered the specification.

Q. You have not read this Dyer patent that was before the Patent Office?

A. Yes, I have seen both of them, but I have not sat down and considered them word for word.

Q. You don't know of any reference in that specification to the sediment trap 184?

A. Well, I see it on page 3 of the Dyer patent No. 2,392,652, column 1, line 33, where there is this statement:

> "Beneath the insert 180 there is provided a passage 184 through which water flows to four sets of passages 186 which extend through the edge of the bottom 166 and connect to a recess 188 formed at the bottom of each of the four vertical risers 190."

Q. Then you go to the bottom of the column, and it tells you that will remove the dirt by centrifugal operation when the tub is spun, doesn't it?

A. What it actually says is this, beginning at line 62:

> "The water is drawn through the outlets 182 and
721 186 and up the risers 190 by centrifugal force since the risers 190 are tapered outwardly and have a spout which overhangs the collecting trough 34. These passages form a centrifugal pump which rapidly ex-

pels the water from the tub into the trough from which it flows down through the pipe 36 to the drain. This method of removing water also provides an excellent means for removing the sand and dirt which does not remain in suspension in the water but which collects in the bottom of the tub adjacent to the holes 182."

Do you want me to read more?

Q. Go ahead.

The Court: Can't you answer the question?

The Witness: Sir?

The Court: Can you answer the question without reading it all?

The Witness: May I have the question repeated?

By Mr. Ooms:

Q. It does describe the fact that upon spinning
722 the tub the water carries dirt out of that annular trap in the bottom up through the channels on the outside and discharges it, doesn't it?

A. It says that dirt goes to the bottom of the tub and from there during the discharge it is pulled through the holes 182, as I understand the disclosure; and it nowhere uses the terminology "angular trap" in describing the space under the ring 182.

Q. But it is an annular trap?

A. Not unless it traps something. Apparently the sand stays outside of that until the water flow begins.

Q. When the water flow begins, the centrifugal force carries the water and sand through the spout out of the tub, doesn't it?

A. Well, it says here—

Q. I am not asking you what it says. How does the structure work?

A. Well, I will tell you how I think it works.

Q. Go ahead.

A. I think that this machine does not really permit the sand or hard material to settle very much in the bot-
723 tom of this tub, because it has an oscillator that goe up and down and then it has a pumping action.

Q. You are now talking about the washing cycle?

A. Yes, and I say it forces the water back and forth across the bottom of the tub.

Q. Suppose the dirt does get there?

A. Well, let me finish.

Q. I am not talking about the washing, sir. You are trying to evade me. If the dirt gets down in there. Let the washing alone a second or two.

A. Well.

Q. If the dirt gets down in there, in that trap between 182 and the center and within the space 184 outside the holes 182.

A. There is nothing to indicate that the sand has gotten over in the position 184.

Q. I did not ask you if there was anything to indicate. The way the structure is shown, how does it work?

A. I don't think it works that way.

Q. You don't think the water carries the dirt out of there?

A. Yes, I do. I think the water carries the dirt out during extraction, carries it from the center of the
724 tub out through the holes 182 and the other passage, as it states.

Q. And out of the spout?

A. Yes.

Q. Look at Dunham. Doesn't that work the same except the trap is not angular?

A. No.

Q. Do you have any question that the dirt gets into that trap at the bottom of the channel 20 adjoining the right side of that figure 1 in the Dunham patent?

A. The patent says it does not. I don't question it.

Q. What do you think happens to the dirt when spinning the tub?

A. I think it stays there.

Q. You don't think the water carries it out?

A. No.

Mr. Ooms: That is all.

Mr. Carlsen: No re-direct.

(Witness excused.)

Mr. Carlsen: We rest.

725 Mr. Ooms: I would like to put on Dr. Colburn for two or three questions about the structure shown in the Dunham patent. It won't take but two minutes.

726 (Thereupon the defendant offered the following evidence in surrebuttal:)

WILLIAM COLBURN, a witness on the part of the defendant, having been heretofore duly sworn herein, being recalled, testified further as follows:

Direct Examination by Mr. Ooms.

Q. You are the same Dr. Colburn who was sworn in this case yesterday?

A. Yes.

Q. Dr. Colburn, I have asked you to look at this drawing, Figure 1 of the Dunham patent 2,274,402, and we have gone through a washing cycle, and there is heavy dirt in the water in that machine, and the machine comes to rest, and then is spun. What happens to the heavy dirt?

A. The heavy dirt will have found its way into the

space 23 during the washing. When the spinning is started, this dirt will be carried by the water, passing through the tubes 20 over the top of those tubes 20.

727 Q. Is there any question about that?

A. None at all.

Mr. Ooms: That is all.

Cross Examination by Mr. Carlsen.

Q. Have you ever made or seen a full-size washing machine built like the structure shown in Figure 1 of the drawing?

A. No, sir.

Mr. Carlsen: No further examination.

Re-Direct Examination by Mr. Ooms.

Q. Does the size make any difference, Dr. Colburn?

A. No, sir.

Re-Cross Examination by Mr. Carlsen.

Q. That is just your opinion, then?

A. Yes.

(Witness excused.)

* * * * *

731 IN THE UNITED STATES DISTRICT COURT

* * (Caption—53-C-1510) * *

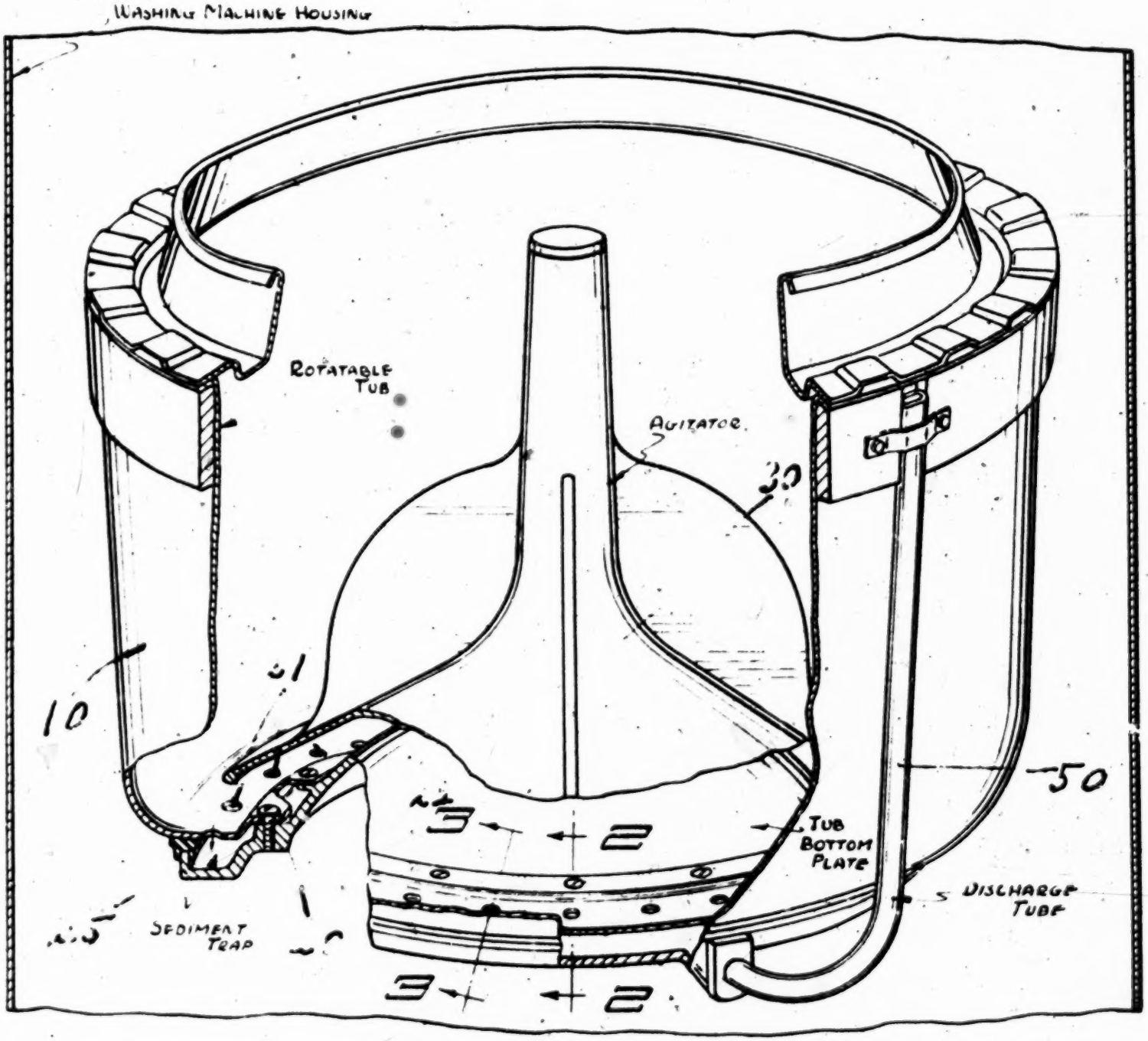
CERTIFICATE

I hereby certify that the foregoing 730 typewritten pages, numbered consecutively from 1 to 730, inclusive (bound in 3 volumes, Volume No. 1 containing pages 1 to 278, inclusive; Volume No. 2 containing pages 279 to 502, inclusive; Volume No. 3 containing pages 503 to 730, inclusive)

are a true and accurate transcript of my original official shorthand notes taken of the proceedings had upon the hearing of the above-entitled cause before the Honorable Philip L. Sullivan, one of the Judges of said Court, on April 23, 24, 25, 26 and 27, 1956.

ALFRED H. FREDERICK,
Official Court Reporter,
United States District Court,
Northern District of Illinois.

May 19, 1956


WASHING MACHINE HOUSING
ROTATABLE TUB
AGITATOR
10
50
TUB BOTTOM PLATE
DISCHARGE TUBE
SEDIMENT TRAP
3
2
3
2

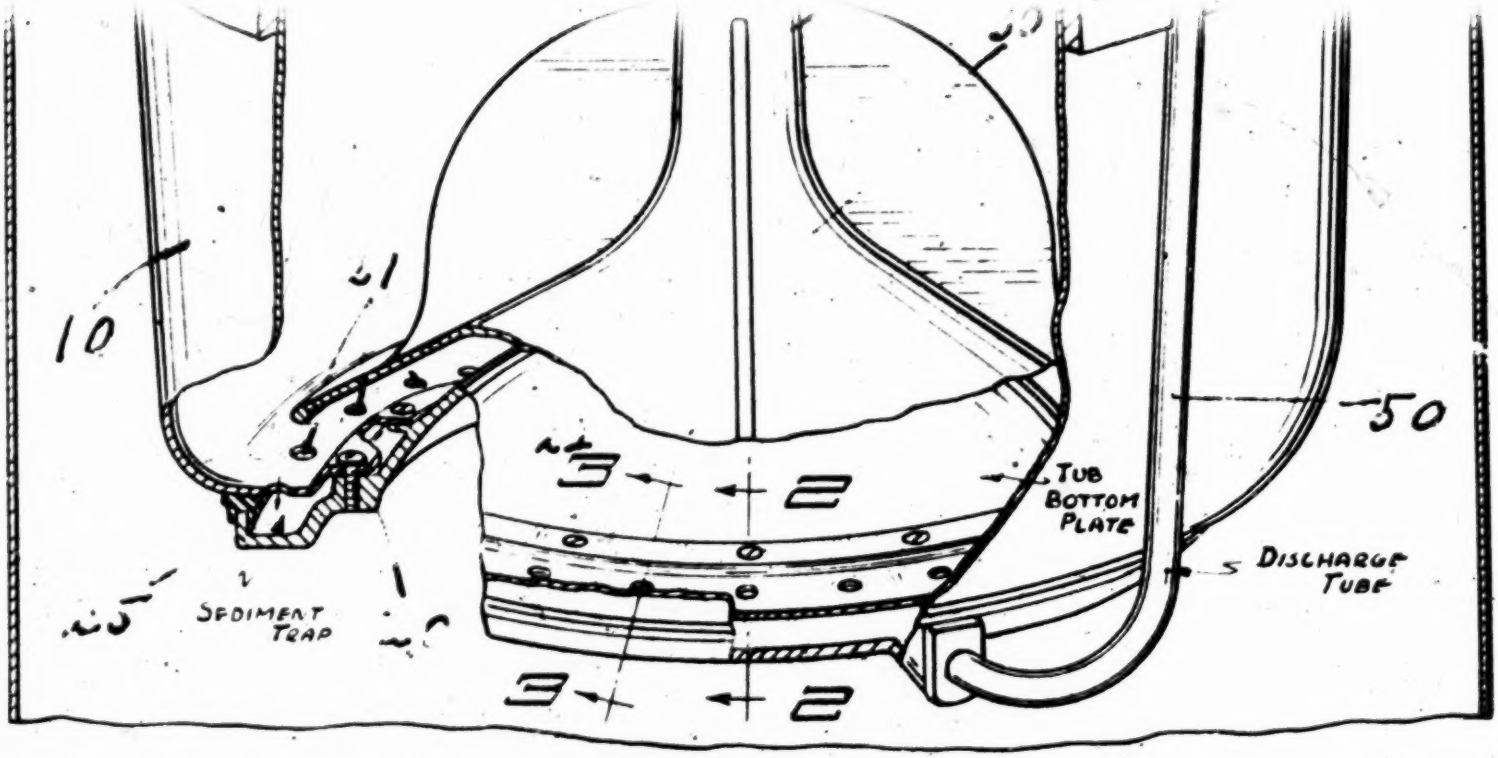


FIG. 1

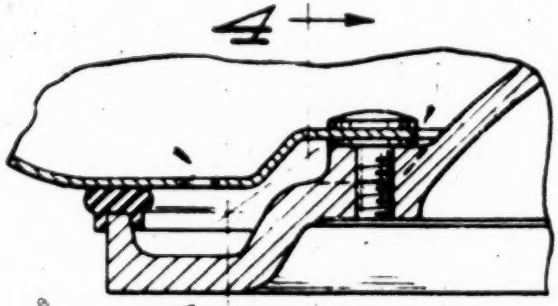


FIG. 2

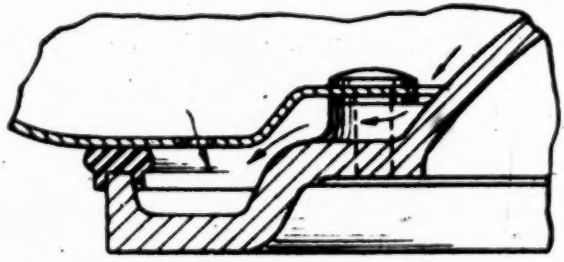


FIG. 3

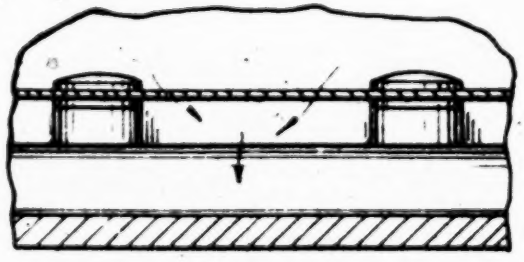


FIG. 4

FIG. 1.

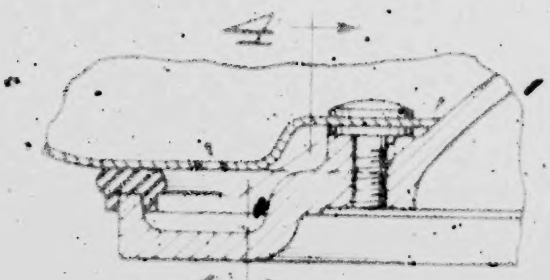


FIG. 2

FIG. 3

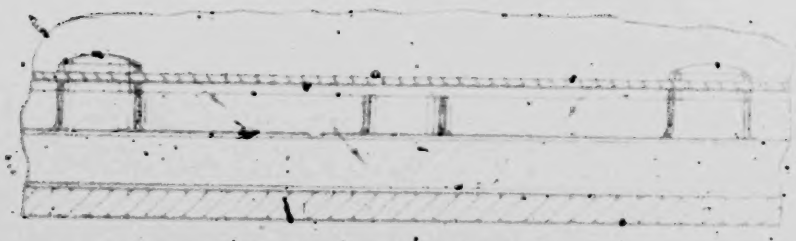
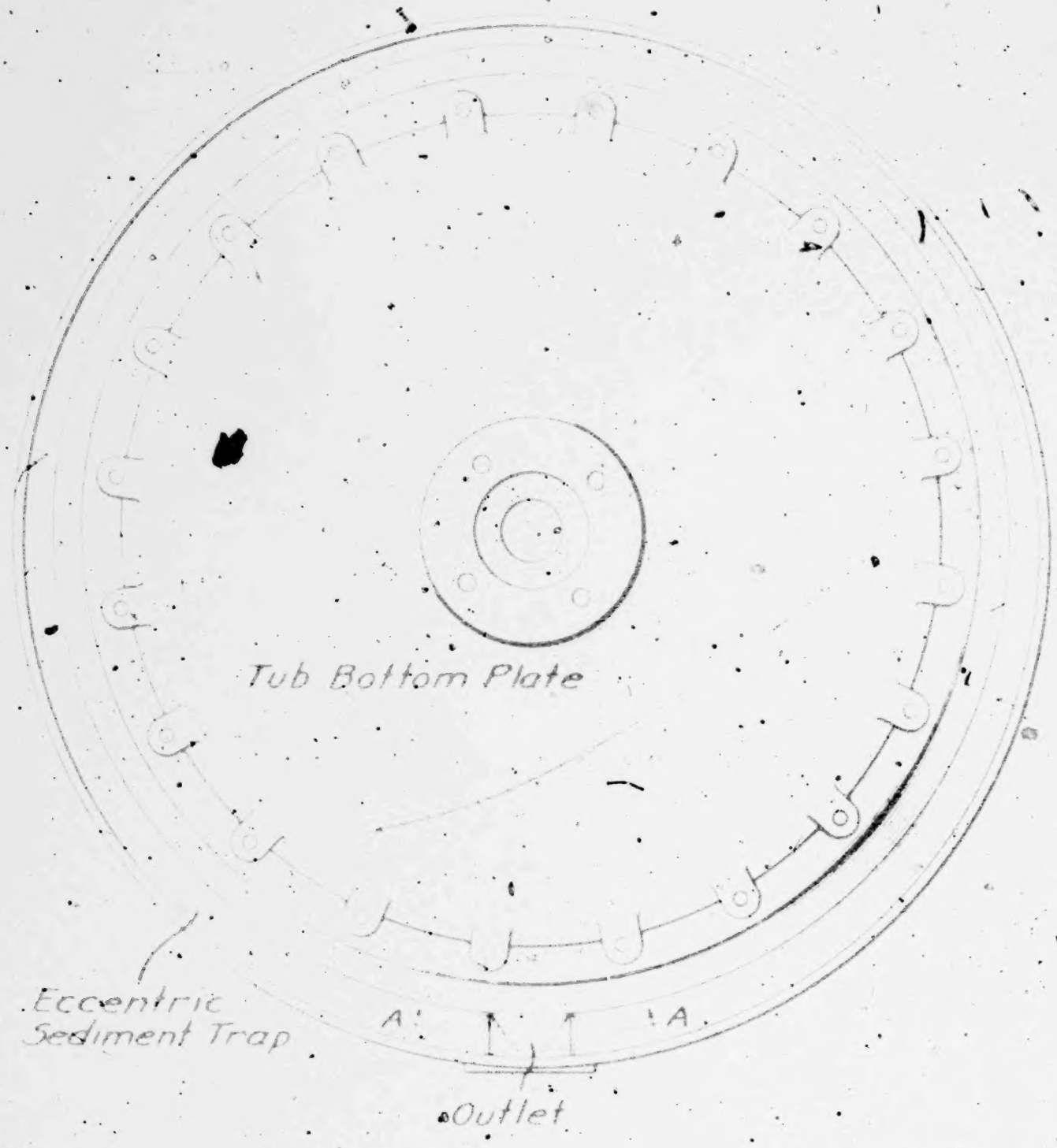
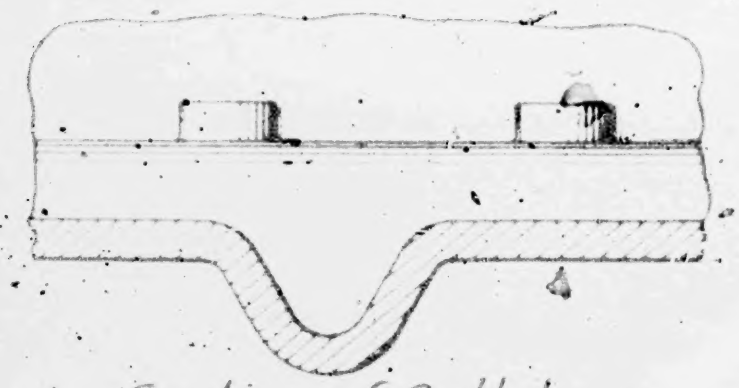


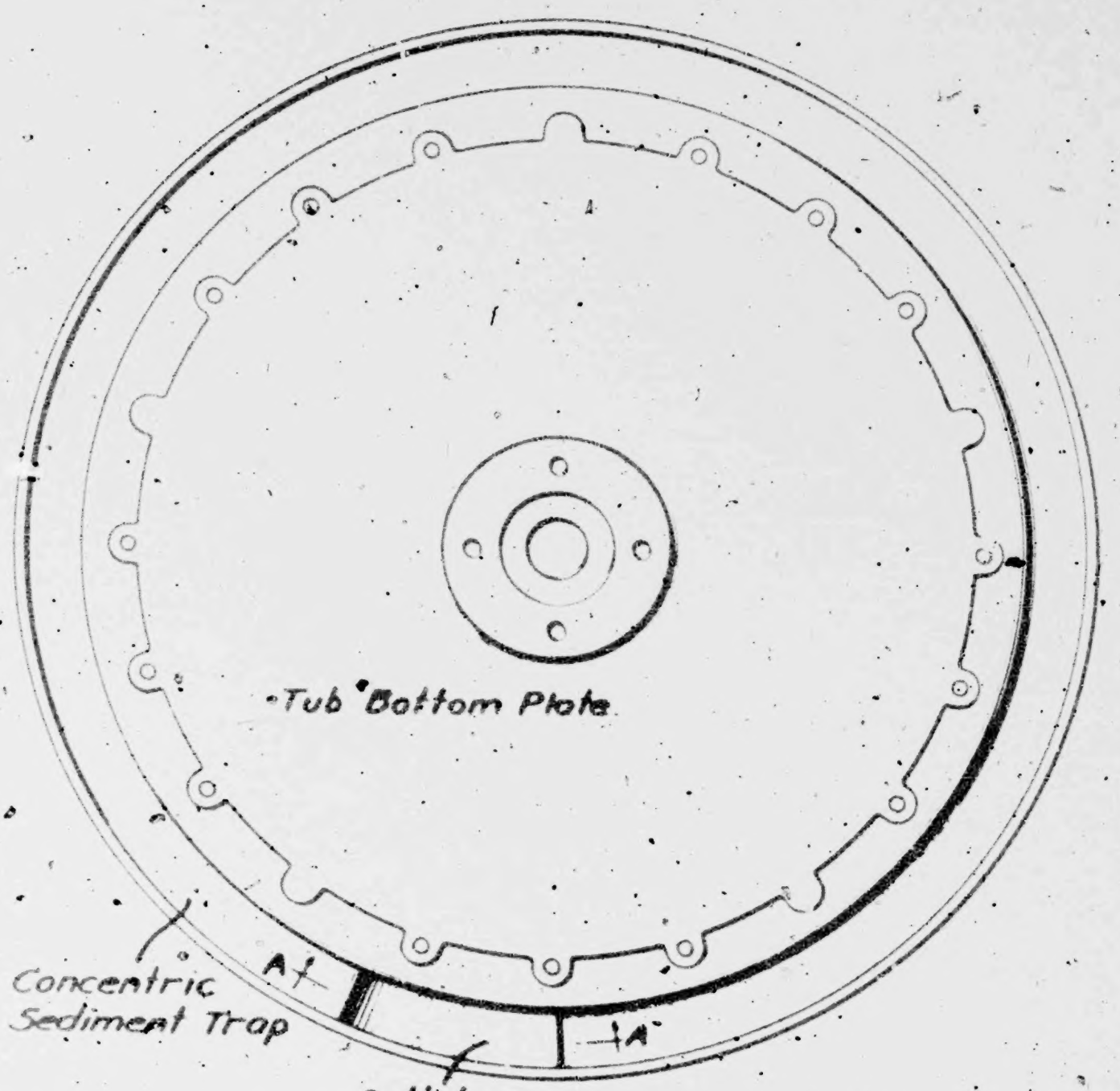
FIG. 4

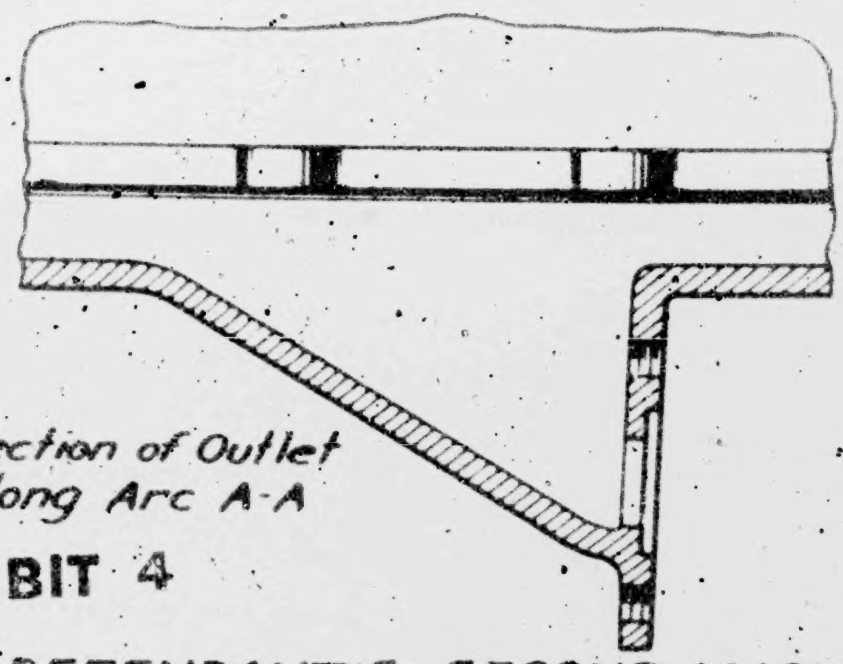




Section of Outlet
along Arc A-A

DEFENDANT'S FIRST MACHINE
PLAINTIFF'S EXHIBIT 3





PLAINTIFF'S EXHIBIT 4

DEFENDANT'S SECOND MACHINE.

Plaintiff's Exhibit 5. 446

May 17, 1949. G. P. CASTNER 2,470,140

WASHING MACHINE HAVING ROTATABLE TUB WITH UPPER AND LOWER DISCHARGE MEANS

Filed Dec. 21, 1945 2 Sheets-Sheet 1

FIG 1

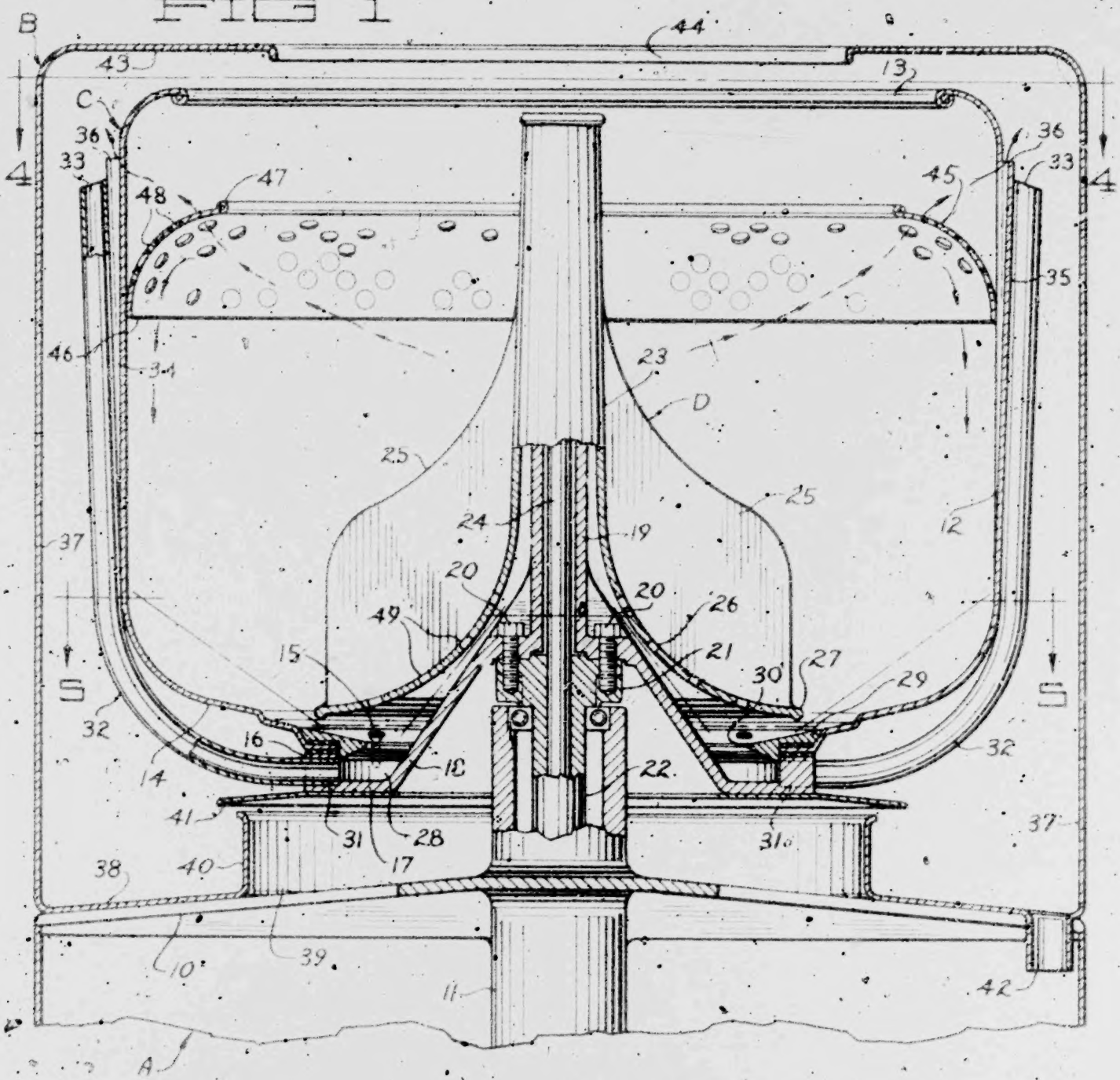
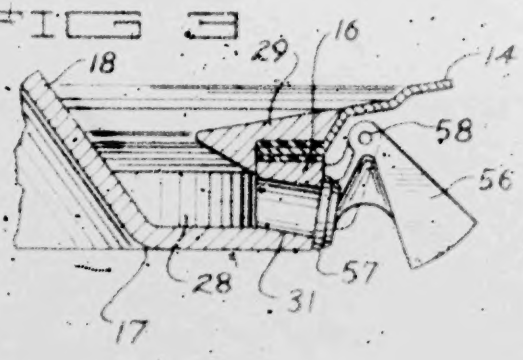


FIG 3



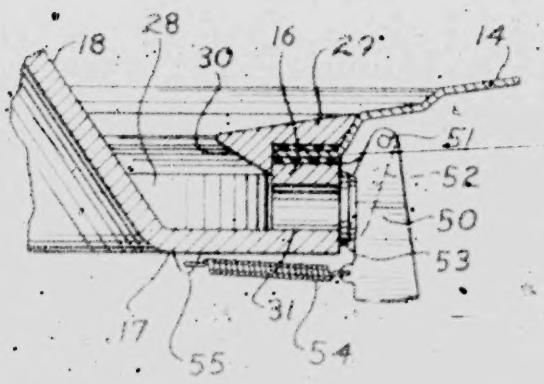


FIG 2

Inventor
GEORGE P. CASTNER.

By Carlsen & Hazle
Attorneys

Plaintiff's Exhibit S. 447

May 17, 1949. G. P. CASTNER 2,470,140

WASHING MACHINE HAVING ROTATABLE TUB WITH UPPER AND LOWER DISCHARGE MEANS

Filed Dec. 21, 1945 2 Sheets-Sheet 2

FIG 4

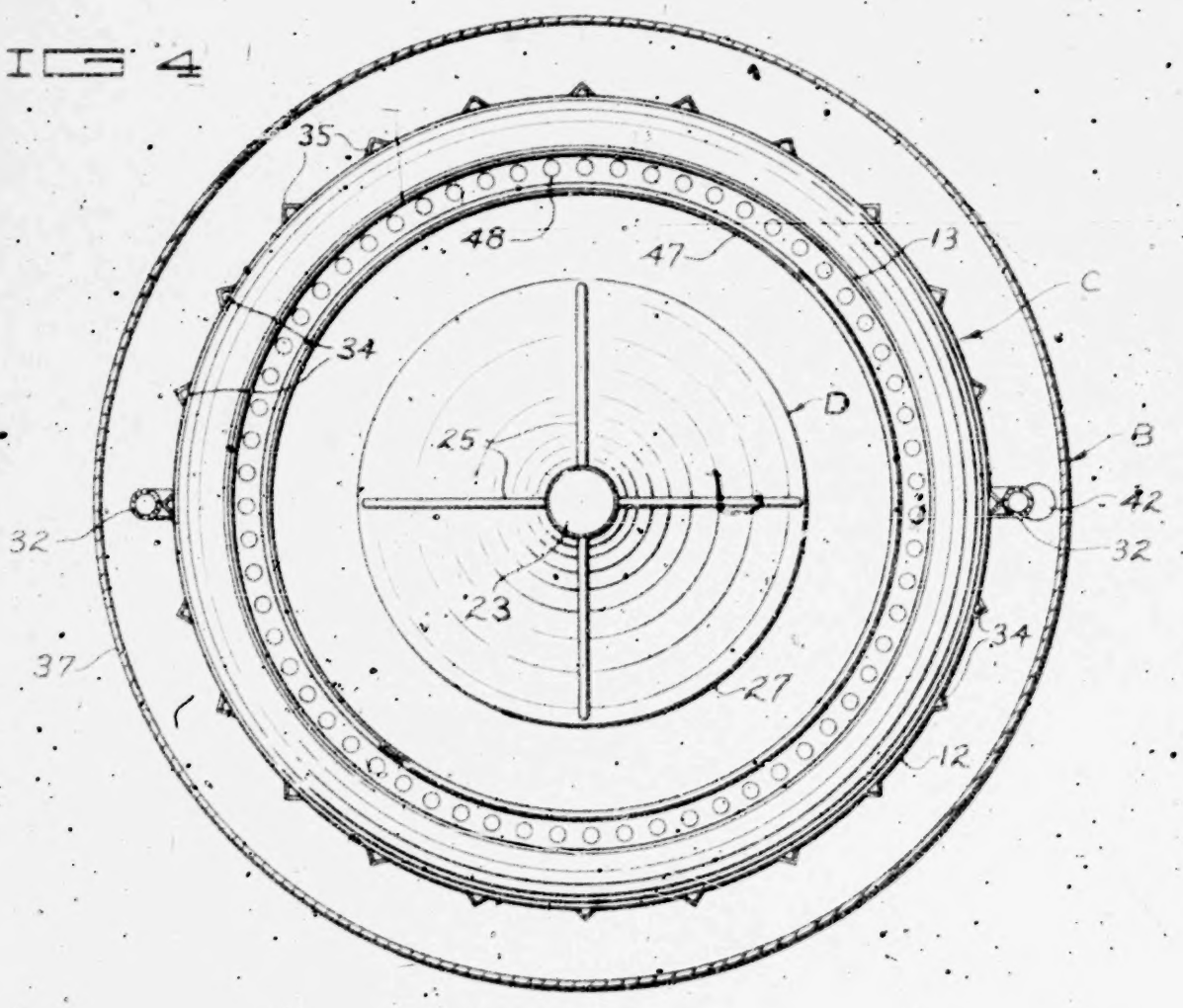
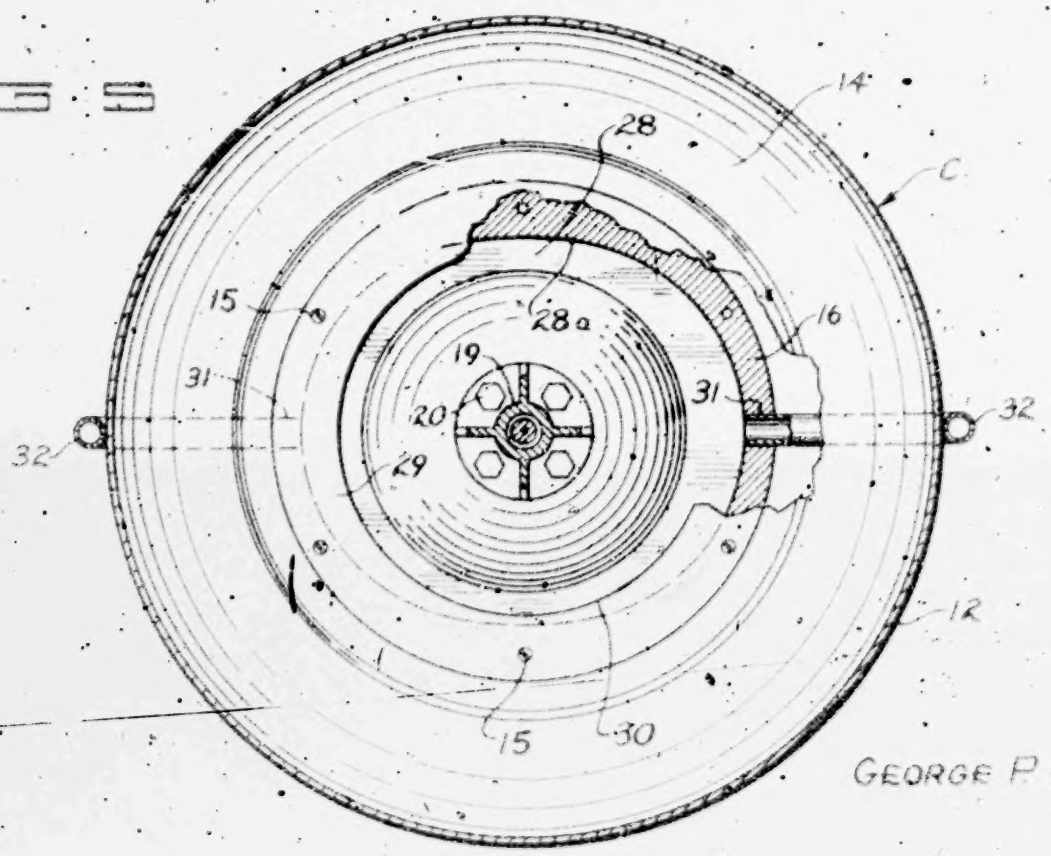


FIG 5



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Plaintiff's Exhibit 5.

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UNITED STATES PATENT OFFICE

2,470,140

WASHING MACHINE HAVING ROTATABLE TUB WITH UPPER AND LOWER DISCHARGE MEANS.

George P. Castner, Webster City, Iowa, assignor to Solar Corporation, Milwaukee, Wis., a corporation of Delaware

Application December 21, 1945, Serial No. 636,304

5 Claims. (Cl. 68—23)

REISSUED
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This invention relates generally to improvements in washing machines and more particularly to improvements in means for disposal of the wash and rinse water or liquid and accumulated sedimentary material or dirt from such machines.

The invention particularly aims to improve that type of machine, ordinarily used domestically, wherein the clothes are washed and rinsed by an agitating action of any kind and are then dried centrifugally, leaving the clothes in a so-called damp-dry condition. For the centrifugal extraction of the washing and rinsing water, or liquid, from the clothes it is customary to employ a perforated basket or container for the clothes, through the perforations of which container the liquid can escape as the container is spun. It is, of course, necessary in such case to operate the perforated container within an outer tub so that the water or liquid will be confined, but in this case there is a waste of water since the water surrounding the container within the tub is of no benefit to either washing or rinsing operations. The volume of water thus wasted is considerable, since the waste zone extends entirely around the container.

In accordance with my invention, and as an important object thereof, I provide a machine having an imperforate tub used to hold both the clothes and the entire volume of wash or rinse water or liquid so that a materially smaller quantity of water is required for a given amount of clothes. The same tub is also used as an extractor, being spun to eject the water by centrifugal force upwardly and outwardly from the tub, so that the clothes may be also dried without use of a perforated tub or liner for the purpose.

The use of an imperforate tub for this purpose, however, brings up the problem of the disposal of the sedimentary deposit which accumulates as washing operations proceed. This sediment, composed of sand, extracted dirt and such heavy foreign particles, ordinarily escapes through the perforations in a perforated tub during the washing operation or as it is spun during extraction, but in the imperforate tub must be drained off or disposed of in some other fashion since it obviously will not work up through the clothes, and be expelled with the water, in this type of construction. The use of a drain valve, and accommodating its opening and closing operations to the spinning action of the tub introduces mechanical and operational difficulties so great as

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to make it impractical, and such a valve as well is quite expensive to manufacture.

A further and important object of my present invention, therefore, resides in the provision of practical, simple and efficacious means for disposal of the sediment from an imperforate tub as used for both washing and centrifugal extraction, and in which the positive and complete disposal of accumulated sedimentary deposits occurs as a concomitant of the spinning during extraction, without attention on the part of the operator.

Still another object is to provide a machine of this nature having means for effectively disposing of the scum or suds which accumulates on the surface of the water during the washing operation, and thus preventing this material from settling upon and sifting through the clothes as the water is extracted, as ordinarily happens.

The foregoing and other more detailed objects and advantages of my invention will be disclosed in the course of the following specification, reference in which is made to the accompanying drawing, wherein:

Fig. 1 is a vertical, diametrical sectional view through the upper portion of a washing machine embodying my invention.

Figs. 2 and 3 are similar sectional detail views of lower portions of the washing and spinning tub, showing two modifications of sediment disposal valves in accordance with my invention.

Fig. 4 is a horizontal sectional view of the machine along the line 4—4 in Fig. 1.

Fig. 5 is a horizontal section taken substantially along the line 5—5 in Fig. 1.

Referring now more particularly and by reference characters to the drawing, A designates a base frame upon which the washer proper, comprising an outer casing or stationary tub B, an inner rotatable or washing and spinning tub C, and agitator D, are mounted and supported. The base frame A includes a top member or spider 10 upon which the tub B, or casing as it will be hereinafter called, is supported, and further has an upright, centrally located bearing 11 through which is journaled and supported means for spinning the tub C and operating the agitator D. The base frame may further as usual support a motor or engine and transmission, none of which are shown, by which these parts are operated.

The tub C has a generally cylindrical wall 12 formed at the top with an opening 13 to receive the clothes and water. The bottom 14 of this tub is somewhat bowl-shaped and slopes inwardly and is fastened, as by screws 15, to an annular

upstanding rim 16 upon a base plate or bottom member 17. This base plate 17 has an upwardly cupped center portion 18 which is in turn formed with a reduced tubular upward extension 19, and said center of the base plate is secured by cap screws 20 to the enlarged upper end 21 of a tubular shaft 22 or sleeve journaled through antifriction bearings suitably located in the bearing 11. The shaft 22 and the tub may be rotated at high speed, when required, by the motor or operating mechanism in the bottom of the machine.

The agitator D has a tubular center portion 23 which is placed over the extension 19 of the tub base and the agitator is attached to and supported on a shaft 24. This shaft 24 depends through the tubular tub drive shaft 22 and may be oscillated or otherwise operated to cause wings or fins 25 upon the agitator to agitate and wash the clothes placed in the tub, in the usual manner. It will be noted that the lower skirt portion of the agitator's hollow center portion 23 is belled or flared out in a downward direction, as designated at 26, and that the outer lower rim 27 thus formed upon the agitator stands some distance above the center portion of the tub bottom.

The upstanding rim 16 of the bottom plate 17 of the tub forms a shallow, annular sediment trap 28 at the bottom, center of the tub. Sedimentary material will be guided into this trap 28 by the inwardly and downwardly sloping bottom 14 of the tub and to facilitate the flow of such material into the trap I provide, in the construction here shown, a rim member 29 which is secured around the inner margin of the tub bottom where it is fastened to the aforesaid rim 16, and which is held in place by the screws 15. As clearly shown this rim member 29 extends inwardly as at 30 beyond the rim 16 and thus overhangs the outer marginal portion of the sediment trap. It should here also be noted that while the rim 27 of agitator skirt 26 is spaced above the rim 29, to permit the movement of sediment into the trap 28, the rim of the skirt extends radially outwardly beyond the inner edge of the rim 29 to thereby effectively cover the trap and prevent articles being washed from moving down into the trap. Such moving is further prevented by the fact that the agitator is of the oscillating type wherein the vanes 25 produce a toroidal current which sweeps the articles outwardly over the rim 27 and thence upwardly in a general direction away from the trap, while the heavier sedimentary material finds its way inwardly down over the rim 29 to the trap.

One or more openings or outlets 31 are formed radially outward through the rim 16 and are here shown as two in number located at diametrically opposite points, and communicating with the sediment trap 28, and disposal tubes 32 are secured at one end in said outlets. These tubes extend first outwardly and then upwardly from the outlets 31 and pass up along opposite sides of the tub, to which sides the tubes are secured in any suitable manner. The tubes terminate at their open upper ends 33 some distance below the top of the tub and, as will be noted in Fig. 1, the tubes also incline outward toward their upper ends.

The tub wall 12 is provided with upwardly extending, inwardly opening grooves or channels 34 and as here shown these are formed by upwardly flaring outwardly pressed flutes or corrugations 35. The channels 34 open at upper ends 36 outwardly from the tub, below its upper edge and two of the flaring flutes serve as convenient anchorages for the tubes 32 as seen in Fig. 1.

Also as clearly shown therein the upper ends of the tubes 32 fall below the upper ends 26 of the channels.

The casing B may be either square or round, or any other desired shape, in plan, and has upstanding walls 37, and a bottom 38 which rests upon the frame A. The bottom 38 has a large central opening 39 allowing access from beneath to the tub bottom and adjacent parts; and this opening is defined by an upstanding neck 40 which terminates some distance below the tub. An annular splash shield 41 is secured to the underside of the base plate 17 and overhangs the neck 40 to prevent water from entering opening 39. The casing bottom 38 slopes outwardly from the neck 40 to the walls 37 and adjacent one wall there is provided a drain 42.

The casing further has a top 43 provided with an opening 44 for an obvious purpose, and it will be evident that the casing may not only serve as means for collecting water extracted from the clothes, but may be neatly shaped and finished to act as the exterior trim for the upper part of the machine.

In the operation of the machine as thus far described, it will be apparent the clothes and washing liquid or water may be placed in the tub C and washed by operation of the agitator D in the usual fashion. All of the liquid is contained within the tub and there is no waste or inactive liquid as there is where a perforated container or liner is used, within an outer stationary tub. When the washing is completed the tub C is spun rapidly and the centrifugal action then extracts the water from the clothes leaving them in what may be called a damp-dry condition. In this process the water swirls outwardly and upwardly and emerges from the open upper ends of the channels 34, while the clothes are pressed outwardly and downwardly along the lower and outer interior of the tub. The same action occurs as the clothes are rinsed and the rinsing liquid extracted. As the water leaves the tub C it, of course, accumulates on the bottom of the casing B from whence it is disposed of through the drain 42.

During the washing operation the heavy sedimentary material which is removed from the clothes naturally settles to the bottom of the tub and due to the slope thereof, works its way down over the rim member 29, under the skirt 26, and into the sediment trap 28 as above set forth. As the tub C is then spun to extract the water, this trapped sediment and the water up to the level of the top of the sediment trap, is prevented from whirling upwardly and outwardly with the rest of the liquid from the tub by the inwardly projecting overhanging rim 29. Instead, this trapped sediment and water is caused, by centrifugal force, to escape through the outlets 31 and to be forcibly ejected upwardly and outwardly through the tubes 32 into the casing B and to be disposed of along with the extracted water through the drain 42. Thus it will be seen that the sediment is disposed of as effectively as with the perforated spinning container, without use of a complicated or troublesome drain valve in the tub C, and without any attention on the part of the operator.

Referring to Fig. 5, it will be noted that the inner upright margin of the rim 16, which is in effect the margin 28a of the sediment trap 28, is oval in shape or elongated on an axis coinciding with the diametrically opposed outlets, 31. The effect of this shape of the trap is to cause the material to work toward the outlets 31 so that the

material will be completely expelled when the tub is spun.

Also during the washing operation there collects a scum and suds on top of the water which contains considerable dirt in suspension, and without some means to dispose of this scum it will have a tendency to settle on and sift into the clothes as the water is swirled from the tub in the drying operation. For this purpose I provide a de-scumming means which comprises an annular, upwardly and inwardly curving member or baffle 45 which is secured in any suitable manner by its outer lower edge 46 to the inside of the tub wall 12 some distance below the opening 13. The inner, upper margin 47 of this member 45 is rolled to present a smooth edge and the member is profusely perforated as indicated at 48. The clothes and water may be readily placed in the tub without interference from the member 45 and the washing and rinsing operations may proceed likewise without any trouble on this score, it being noted that the water level in the machine will be substantially even with the upper inner edge of the member 45.

As the extraction is started, however, the curvature of the inner lower surface of the member 45 will guide the clothes downwardly as indicated by the solid line arrows in Fig. 1, while the swirling of the surface water outwardly and upwardly as indicated by the broken arrows will cause the scum and suds atop the water to be carried out through the perforations 48 and out through the channels 34 instead of settling onto the clothes. As the water is put in motion by the spinning tub the tendency of the center of the water mass to settle might cause some of the scum to work down along the bell-like skirt 26 of the agitator and thence to work into the clothes, but to prevent this I perforate this skirt as indicated at 49. The scum may then fall through the openings 49 into the sediment trap 28 for removal therefrom by the action previously described.

In lieu of the tubes 37 for carrying off the sedimentary material, and which tubes must necessarily extend above the water level in the tub as they are here shown, I may provide spring loaded or weighted valves for closing the sediment trap outlets 31 as seen in Figs. 2 and 3. Such valves will normally close the outlets so that the water will be kept in the tub.

As shown in Fig. 2 one form of spring loaded valve for this purpose may comprise a weight 50 pivotally attached at 51 to a lug 52 upon the outer edge of the base plate 17 so that a valve disk 53 carried by or formed on the weight may close against the outer end of the adjacent outlet 31. A retractile coil spring 54 is stretched between the lower end of the weight 50 and a lug 55 beneath the plate 17 and this spring will normally urge the valve disk tightly to its seat to close the outlet as required. However, when the tub C is set to spinning the centrifugal force will cause the weight 50 to swing outward, while overcoming the tension of the spring 54, and so will open the outlet for the discharge of accumulated sediment out into the bottom of the casing B.

The valve of Fig. 3 is similar in that it comprises a similarly pivoted weight 56 and a valve disk 57. The weight 56 is, however, supported outwardly and downwardly from its pivot 58 so that it holds the disk in place to close the outlet 31 by gravity alone. The opening operation of course here also occurs automatically when the tub is spun.

Obviously the tub C need not have a separate bottom plate such as here indicated at 17 in order to form the sediment trap 28. It is only necessary to appropriately form the tub bottom itself to provide a central depression in which the sediment may collect in order to carry out my invention. Also the flutes or corrugations 35 are not necessary to the extraction of the water from the imperforate tub since the extraction may be accomplished merely by appropriately forming the tub walls themselves. The fluted formation of the tub walls does, however, work out effectively with the de-skimming member 45.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, the tub being provided with a recess in its bottom to accumulate and trap sedimentary material during the washing operation and said recess having at least one outlet in its outer wall to discharge such trapped material centrifugally as the tub is spun, and the said recess being so shaped that such outlet will be spaced further from the axis of rotation than other parts of the wall whereby the trapped sedimentary material will work from opposite sides toward said outlet by centrifugal action.

2. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, the tub being provided with a recess in its bottom to accumulate and trap sedimentary material during the washing operation and said recess having oppositely located outlets for centrifugally discharging trapped material from the recess as the tub is spun, and said recess being elongated on an axis coinciding with a line through the outlets whereby trapped material will work toward said outlets by centrifugal force and the recess will be fully emptied of material.

3. In a washing machine, a housing, a tub mounted in the housing for rotation about a substantially vertical axis, said tub having an imperforate side wall which tapers downwardly so that when rotated at high speed centrifugal action will cause the liquid content of the tub to move upwardly along the interior surface of the tub wall and be discharged over the upper end thereof into the housing, said tub being provided at its bottom end with a generally circular sediment receiving chamber, and tubular members extending outwardly from the sediment receiving chamber and thence upwardly along the outside of the tub to centrifugally discharge sedimentary material from the receiving chamber independently of the centrifugal discharge of liquid within the tub up and over the upper edge of the wall thereof.

4. In a washing machine, a rotatable tub having an imperforate upwardly flared side wall operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge, said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap, and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly there-

from to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall.

5. In a washing machine, a tub for containing liquid and material to be washed and mounted for spinning to discharge the liquid centrifugally, said tub having upwardly flared side walls which will cause the centrifugal liquid to move upwardly therealong for discharge from the upper end of the tub, said side walls curving inwardly at their lower ends and terminating in an annular recess adapted to receive liquid and sedimentary material during the washing operation, a circular flange extending inwardly over the outer part of the recess to produce a horizontal separation of liquid during the spinning of the tub whereby the main body of liquid adjacent thereto will be deflected upwardly and whereby the liquid and sediment below the inner edge of the flange will be restricted to the space in the recess below the level of the flange, means for preventing materials being washed from entering the

recess with the sediment, and means for centrifugally discharging the contents of the recess independently of the main upward discharge of liquid from the tub.

GEORGE P. CASTNER.

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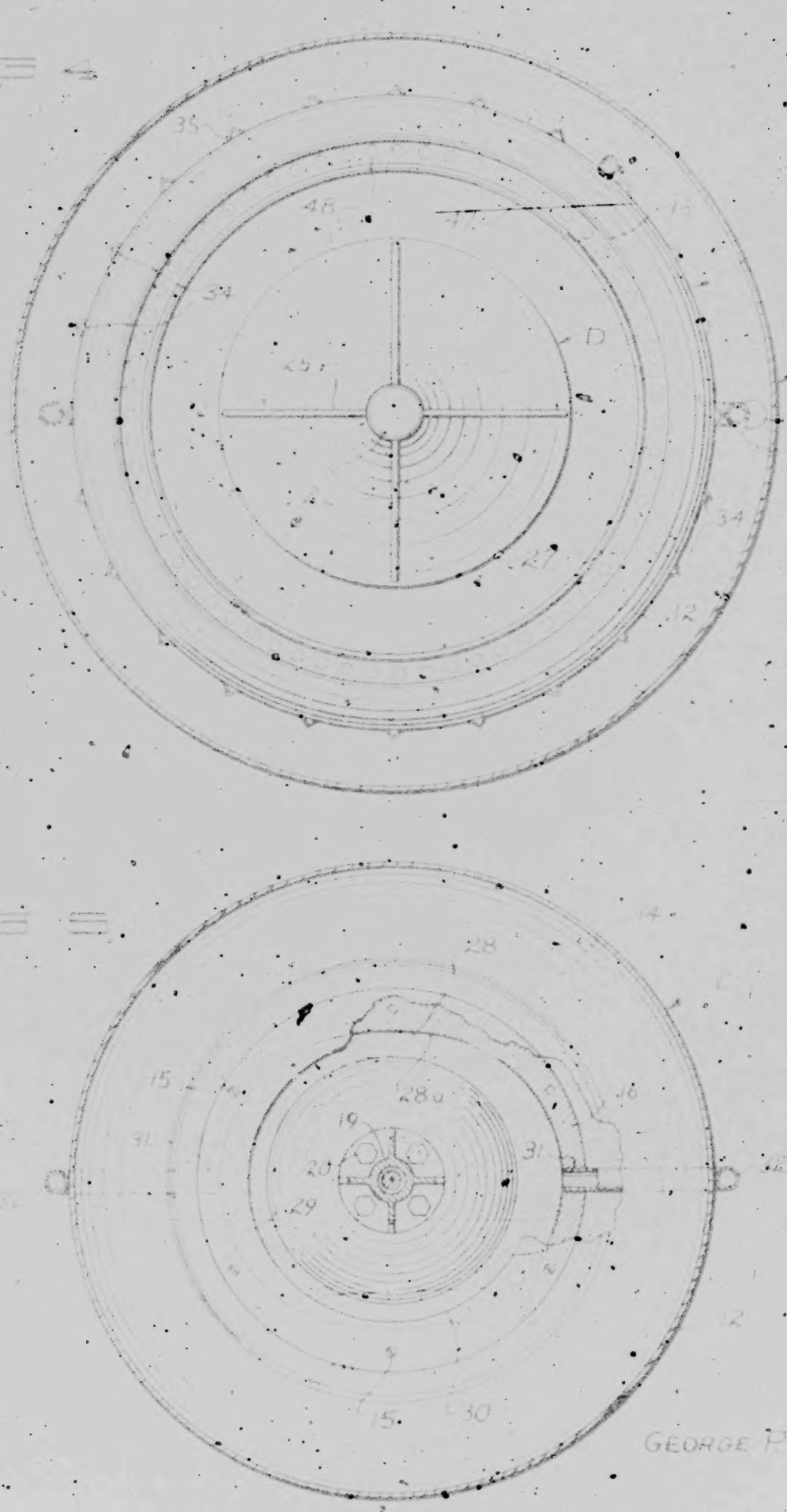

GEORGE P. CASTNER

Carlson & Hayden

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FIG 1

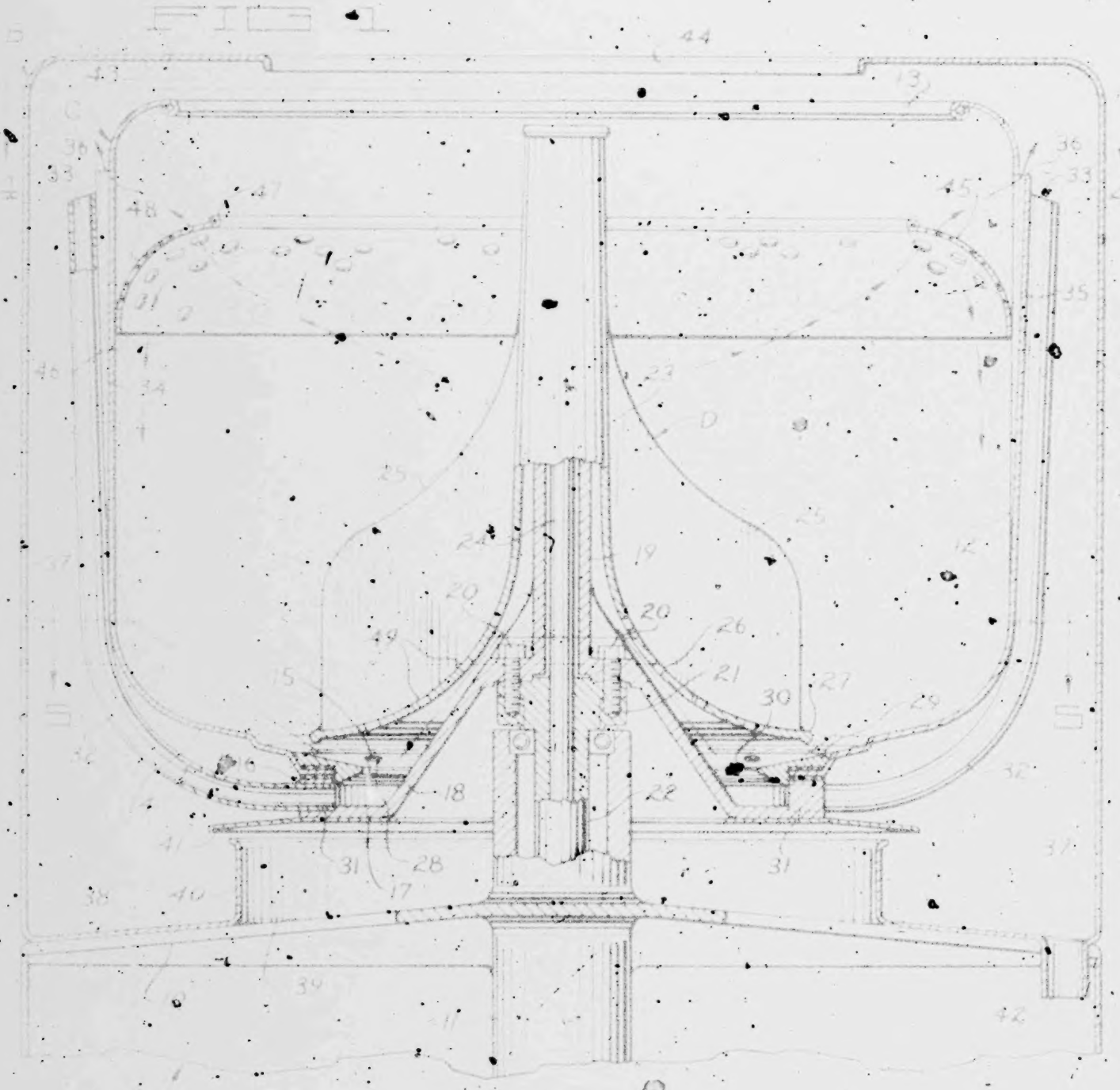


FIG 3

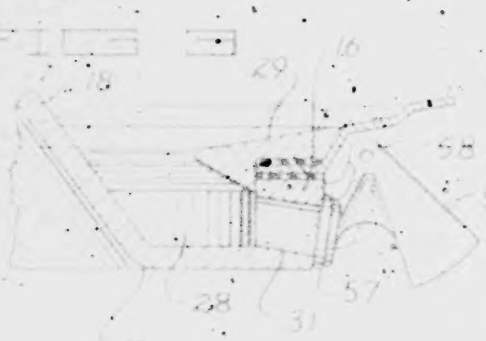
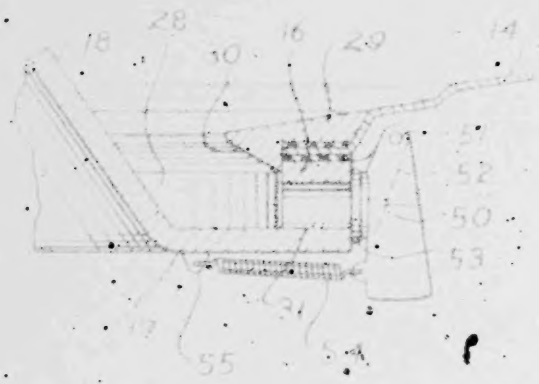


FIG 2



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UNITED STATES PATENT OFFICE

23,626

WASHING MACHINE HAVING ROTATABLE TUB WITH UPPER AND LOWER DISCHARGE MEANS

George P. Castner, Webster City, Iowa, assignor to Solar Corporation, Milwaukee, Wis., a corporation of Delaware

Original No. 2,470,140, dated May 17, 1949, Serial No. 636,304, December 21, 1945. Application for reissue December 8, 1952, Serial No. 324,862

8 Claims. (Cl. 68—23)

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

1

This invention relates generally to improvements in washing machines and more particularly to improvements in means for disposal of the wash and rinse water or liquid and accumulated sedimentary material or dirt from such machines.

The invention particularly aims to improve that type of machine, ordinarily used domestically, wherein the clothes are washed and rinsed by an agitating action of any kind and are then dried centrifugally, leaving the clothes in a so-called damp-dry condition. For the centrifugal extraction of the washing and rinsing water, or liquid, from the clothes it is customary to employ a perforated basket or container for the clothes, through the perforations of which container the liquid can escape as the container is spun. It is, of course, necessary in such case to operate the perforated container within an outer tub so that the water or liquid will be confined, but in this case there is a waste of water since the water surrounding the container within the tub is of no benefit to either washing or rinsing operations. The volume of water thus wasted is considerable, since the waste zone extends entirely around the container.

In accordance with my invention, and as an important object thereof, I provide a machine having an imperforate tub used to hold both the clothes and the entire volume of wash or rinse water or liquid so that a materially smaller quantity of water is required for a given amount of clothes. The same tub is also used as an extractor, being spun to eject the water by centrifugal force upwardly and outwardly from the tub, so that the clothes may be also dried without use of a perforated tub or liner for the purpose.

The use of an imperforate tub for this purpose, however, brings up the problem of the disposal of the sedimentary deposit which accumulates as washing operations proceed. This sediment, composed of sand, extracted dirt and such heavy foreign particles, ordinarily escapes through the perforations in a perforated tub during the washing operation or as it is spun during extraction, but in the imperforate tub must be drained off or disposed of in some other fashion since it obviously will not work up through the clothes, and be expelled with the water, in this type of construction. The use of a drain valve, and accommodating its opening and closing operations to the spinning action of the tub introduces mechanical and operational difficulties so great as to make it impractical, and such a valve as well is quite expensive to manufacture.

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A further and important object of my present invention, therefore, resides in the provision of practical, simple and efficacious means for disposal of the sediment from an imperforate tub as used for both washing and centrifugal extraction, and in which the positive and complete disposal of accumulated sedimentary deposits occurs as a concomitant of the spinning during extraction without attention on the part of the operator.

Still another object is to provide a machine of this nature having means for effectively disposing of the scum or suds which accumulates on the surface of the water during the washing operation, and thus preventing this material from settling upon and sifting through the clothes as the water is extracted, as ordinarily happens.

The foregoing and other more detailed objects and advantages of my invention will be disclosed in the course of the following specification, reference in which is made to the accompanying drawing, wherein:

Fig. 1 is a vertical, diametrical sectional view through the upper portion of a washing machine embodying my invention.

Figs. 2 and 3 are similar sectional detail views of lower portions of the washing and spinning tub, showing two modifications of sediment disposal valves in accordance with my invention.

Fig. 4 is a horizontal sectional view of the machine along the line 4—4 in Fig. 1.

Fig. 5 is a horizontal section taken substantially along the line 5—5 in Fig. 1.

Referring now more particularly and by reference characters to the drawing, A designates a base frame upon which the washer proper, comprising an outer casing or stationary tub B, an inner rotatable or washing and spinning tub C, and agitator D, are mounted and supported. The base frame A includes a top member or spider 10 upon which the tub B, or casing as it will be hereinafter called, is supported, and further has an upright, centrally located bearing 11 through which is journaled and supported means for spinning the tub C and operating the agitator D. The base frame may further as usual support a motor or engine and transmission, none of which are shown, by which these parts are operated.

The tub C has a generally cylindrical wall 12 formed at the top with an opening 13 to receive the clothes and water. The bottom 14 of this tub is somewhat bowl-shaped and slopes inwardly and is fastened, as by screws 15, to an annular upstanding rim 16 upon a base plate or bottom member 17. This base plate 17 has an

Plaintiff's Exhibit 6.
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upwardly cupped center portion 18 which is in turn formed with a reduced tubular upward extension 19, and said center of the base plate is secured by cap screws 20 to the enlarged upper end 21 of a tubular shaft 22 or sleeve journaled through anti-friction bearings suitably located in the bearing 11. The shaft 22 and the tub may be rotated at high speed, when required, by the motor or operating mechanism in the bottom of the machine.

The agitator D has a tubular center portion 23 which is placed over the extension 19 of the tub base and the agitator is attached to and supported on a shaft 24. This shaft 24 depends through the tubular tub drive shaft 22 and may be oscillated or otherwise operated to cause wings or fins 25 upon the agitator to agitate and wash the clothes placed in the tub, in the usual manner. It will be noted that the lower skirt portion of the agitator's hollow center portion 23 is belled or flared out in a downward direction, as designated at 26, and that the outer lower rim 27 thus formed upon the agitator stands some distance above the center portion of the tub bottom.

The upstanding rim 16 of the bottom plate 17 of the tub forms a shallow, annular sediment trap 28 at the bottom, center of the tub. Sedimentary material will be guided into this trap 28 by the inwardly and downwardly sloping bottom 14 of the tub and to facilitate the flow of such material into the trap I provide, in the construction here shown, a rim member 29 which is secured around the inner margin of the tub bottom where it is fastened to the aforesaid rim 16, and which is held in place by the screws 15. As clearly shown this rim member 29 extends inwardly as at 30 beyond the rim 16 and thus overhangs the outer marginal portion of the sediment trap. It should here also be noted that while the rim 27 of agitator skirt 26 is spaced above the rim 29, to permit the movement of sediment into the trap 28, the rim of the skirt extends radially outwardly beyond the inner edge of the rim 29 to thereby effectively cover the trap and prevent articles being washed from moving down into the trap. Such moving is further prevented by the fact that the agitator is of the oscillating type wherein the vanes 25 produce a toroidal current which sweeps the articles outwardly over the rim 27 and thence upwardly in a general direction away from the trap, while the heavier sedimentary material finds its way inwardly down over the rim 29 to the trap.

Inasmuch as the sediment trap 28 is annular in form and extends entirely around the base plate, under and concentric with the agitator skirt, it will be seen that all areas of the dished bottom part 14 of the tub will drain freely and directly into the trap.

One or more openings or outlets 31 are formed radially outward through the rim 16 and are here shown as two in number located at diametrically opposite points, and communicating with the sediment trap 28, and disposal tubes 32 are secured at one end in said outlets. These tubes extend first outwardly and then upwardly from the outlets 31 and pass up along opposite sides of the tub, to which sides the tubes are secured in any suitable manner. The tubes terminate at their open upper ends 33 some distance below the top of the tub and, as will be noted in Fig. 1, the tubes also incline outward toward their upper ends.

The tub wall 12 is provided with upwardly extending, inwardly opening grooves or channels 34 and as here shown these are formed by upwardly flaring outwardly pressed flutes or corrugations 35. The channels 34 open at upper ends 36 outwardly from the tub, below its upper edge and two of the flaring flutes serve as convenient anchorages for the tubes 32 as seen in Fig. 1. Also as clearly shown therein the upper ends of the tubes 32 fall below the upper ends 36 of the channels.

The casing B may be either square or round, or any other desired shape, in plan, and has upstanding walls 37, and a bottom 38 which rests upon the frame A. The bottom 38 has a large central opening 39 allowing access from beneath to the tub bottom and adjacent parts, and this opening is defined by an upstanding neck 40 which terminates some distance below the tub. An annular splash shield 41 is secured to the underside of the base plate 17 and overhangs the neck 40 to prevent water from entering opening 39. The casing bottom 38 slopes outwardly from the neck 40 to the walls 37 and adjacent one wall there is provided a drain 42.

The casing further has a top 43 provided with an opening 44 for an obvious purpose, and it will be evident that the casing may not only serve as means for collecting water extracted from the clothes, but may be neatly shaped and finished to act as the exterior trim for the upper part of the machine.

In the operation of the machine as thus far described, it will be apparent the clothes and washing liquid or water may be placed in the tub C and washed by operation of the agitator D in the usual fashion. All of the liquid is contained within the tub and there is no waste or inactive liquid as there is where a perforated container or liner is used, within an outer stationary tub. When the washing is completed the tub C is spun rapidly and the centrifugal action then extracts the water from the clothes leaving them in what may be called a damp-dry condition. In this process the water swirls outwardly and upwardly and emerges from the open upper ends of the channels 34, while the clothes are pressed outwardly and downwardly along the lower and outer interior of the tub. The same action occurs as the clothes are rinsed and the rinsing liquid extracted. As the water leaves the tub C it, of course, accumulates on the bottom of the casing B from whence it is disposed of through the drain 42.

During the washing operation the heavy sedimentary material which is removed from the clothes naturally settles to the bottom of the tub and due to the slope thereof, works its way down over the rim member 29, under the skirt 26, and into the sediment trap 28 as above set forth. As the tub C is then spun to extract the water, this trapped sediment and the water up to the level of the top of the sediment trap, is prevented from whirling upwardly and outwardly with the rest of the liquid from the tub by the inwardly projecting overhanging rim 29. Instead, this trapped sediment and water is caused, by centrifugal force, to escape through the outlets 31 and to be forcibly ejected upwardly and outwardly through the tubes 32 into the casing B and to be disposed of along with the extracted water through the drain 42. Thus it will be seen that the sediment is disposed of as effectively as with the perforated spinning container, without use of a complicated or troublesome drain valve

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in the tub C, and without any attention on the part of the operator.

Referring to Fig. 5, it will be noted that the inner upright margin of the rim 16, which is in effect the margin 28a of the sediment trap 28, is oval in shape or elongated on an axis coinciding with the diametrically opposed outlets 31. The effect of this shape of the trap is to cause the material to work toward the outlets 31 so that the material will be completely expelled when the tub is spun.

Also during the washing operation there collects a scum and suds on top of the water which contains considerable dirt in suspension, and without some means to dispose of this scum it will have a tendency to settle on and sift into the clothes as the water is swirled from the tub in the drying operation. For this purpose I provide a de-scumming means which comprises an annular, upwardly and inwardly curving member or baffle 45 which is secured in any suitable manner by its outer lower edge 46 to the inside of the tub wall 12 some distance below the opening 13. The inner, upper margin 47 of this member 45 is rolled to present a smooth edge and the member is profusely perforated as indicated at 48. The clothes and water may be readily placed in the tub without interference from the member 45 and the washing and rinsing operations may proceed likewise without any trouble on this score, it being noted that the water level in the machine will be substantially even with the upper inner edge of the member 45.

As the extraction is started, however, the curvature of the inner lower surface of the member 45 will guide the clothes downwardly as indicated by the solid line arrows in Fig. 1, while the swirling of the surface water outwardly and upwardly as indicated by the broken arrows will cause the scum and suds atop the water to be carried out through the perforations 48 and out through the channels 34 instead of settling onto the clothes. As the water is put in motion by the spinning tub the tendency of the center of the water mass to settle might cause some of the scum to work down along the bell-like skirt 21 of the agitator and thence to work into the clothes, but to prevent this I perforate this skirt as indicated at 49. The scum may then fall through the openings 49 into the sediment trap 28 for removal therefrom by the action previously described.

In lieu of the tubes 32 [37] for carrying off the sedimentary material, and which tubes must necessarily extend above the water level in the tub as they are here shown, I may provide spring loaded or weighted valves for closing the sediment trap outlets 31 as seen in Figs. 2 and 3. Such valves will normally close the outlets so that the water will be kept in the tub.

As shown in Fig. 2 one form of spring loaded valve for this purpose may comprise a weight 50 pivotally attached at 51 to a lug 52 upon the outer edge of the base plate 17 so that a valve disk 53 carried by or formed on the weight may close against the outer end of the adjacent outlet 31. A retractile coil spring 54 is stretched between the lower end of the weight 50 and a lug 55 beneath the plate 17 and this spring will normally urge the valve disk tightly to its seat to close the outlet as required. However, when the tub C is set to spinning the centrifugal force will cause the weight 50 to swing outward, while overcoming the tension of the spring 54, and so will open the outlet for the discharge of accumulated sediment out into the bottom of the casing B.

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The valve of Fig. 3 is similar in that it comprises a similarly pivoted weight 56 and a valve disk 57. The weight 56 is, however, supported outwardly and downwardly from its pivot 58 so that it holds the disk in place to close the outlet 31 by gravity alone. The opening operation of course here also occurs automatically when the tub is spun.

Obviously the tub C need not have a separate bottom plate such as here indicated at 17 in order to form the sediment trap 28. It is only necessary to appropriately form the tub bottom itself to provide a central depression in which the sediment may collect in order to carry out my invention. Also the flutes or corrugations 35 are not necessary to the extraction of the water from the imperforate tub since the extraction may be accomplished merely by appropriately forming the tub walls themselves. The fluted formation of the tub walls does, however, work out effectively with the de-skimming member 45.

It is understood that suitable modifications may be made in the structure as disclosed; provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, the tub being provided with a recess in its bottom to accumulate and trap sedimentary material during the washing operation and said recess having at least one outlet in its outer wall to discharge such trapped material centrifugally as the tub is spun, and the said recess being so shaped that such outlet will be spaced further from the axis of rotation than other parts of the wall whereby the trapped sedimentary material will work from opposite sides toward said outlet by centrifugal action.

2. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, the tub being provided with a recess in its bottom to accumulate and trap sedimentary material during the washing operation and said recess having oppositely located outlets for centrifugally discharging trapped material from the recess as the tub is spun; and said recess being elongated on an axis coinciding with a line through the outlets whereby trapped material will work toward said outlets by centrifugal force and the recess will be fully emptied of material.

3. In a washing machine, a housing, a tub mounted in the housing for rotation about a substantially vertical axis, said tub having an imperforate side wall which tapers downwardly so that when rotated at high speed centrifugal action will cause the liquid content of the tub to move upwardly along the interior surface of the tub wall and be discharged over the upper end thereof into the housing, said tub being provided at its bottom end with a generally circular sediment receiving chamber, and tubular members extending outwardly from the sediment receiving chamber and thence upwardly along the outside of the tub to centrifugally discharge sedimentary material from the receiving chamber independently of the centrifugal discharge of liquid within the tub up and over the upper edge of the wall thereof.

4. In a washing machine, a rotatable tub hav-

ing an imperforate upwardly flared side wall operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge, said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap, and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall.

5. In a washing machine, a tub for containing liquid and material to be washed and mounted for spinning to discharge the liquid centrifugally, said tub having upwardly flared side walls which will cause the centrifugal liquid to move upwardly therealong for discharge from the upper end of the tub, said side walls curving inwardly at their lower ends and terminating in an annular recess adapted to receive liquid and sedimentary material during the washing operation, a circular flange extending inwardly over the outer part of the recess to produce a horizontal separation of liquid during the spinning of the tub whereby the main body of liquid adjacent thereto will be deflected upwardly and whereby the liquid and sediment below the inner edge of the flange will be restricted to the space in the recess below the level of the flange, means for preventing materials being washed from entering the recess with the sediment, and means for centrifugally discharging the contents of the recess independently of the main upward discharge of liquid from the tub.

6. In a washing machine, a rotatable tub having an imperforate upwardly flared side wall operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge, said wall having an inwardly dished bottom portion terminating in a generally circular depression forming a substantially annular sediment trap, and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall.

7. In a washing machine, a rotatable tub having an imperforate upwardly flared side wall operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge, said wall having an inwardly dished bottom portion terminating in a substantially circular depression forming a sediment trap concentrically within and below said dished bottom portion, and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall.

8. In a washing machine, a rotatable tub having an imperforate upwardly flared side wall operative, when rotated at high speed, to centrifugally discharge the fluid content of the tub upwardly along said wall and thence outwardly over its upper edge, said wall having an inwardly dished bottom portion terminating in a depression forming a sediment trap, said depression extending annularly about the axis of the tub and being disposed within and below the dished bottom portion thereof whereby sediment may drain radially inwardly from all parts of the bottom portion and into the sediment trap, and a tube connected at its inner end to the sediment trap and extending outwardly and upwardly therefrom to discharge sedimentary material from the trap independently of the upward and outward centrifugal discharge of the main body of fluid along and over the tub wall.

GEORGE P. CASTNER.

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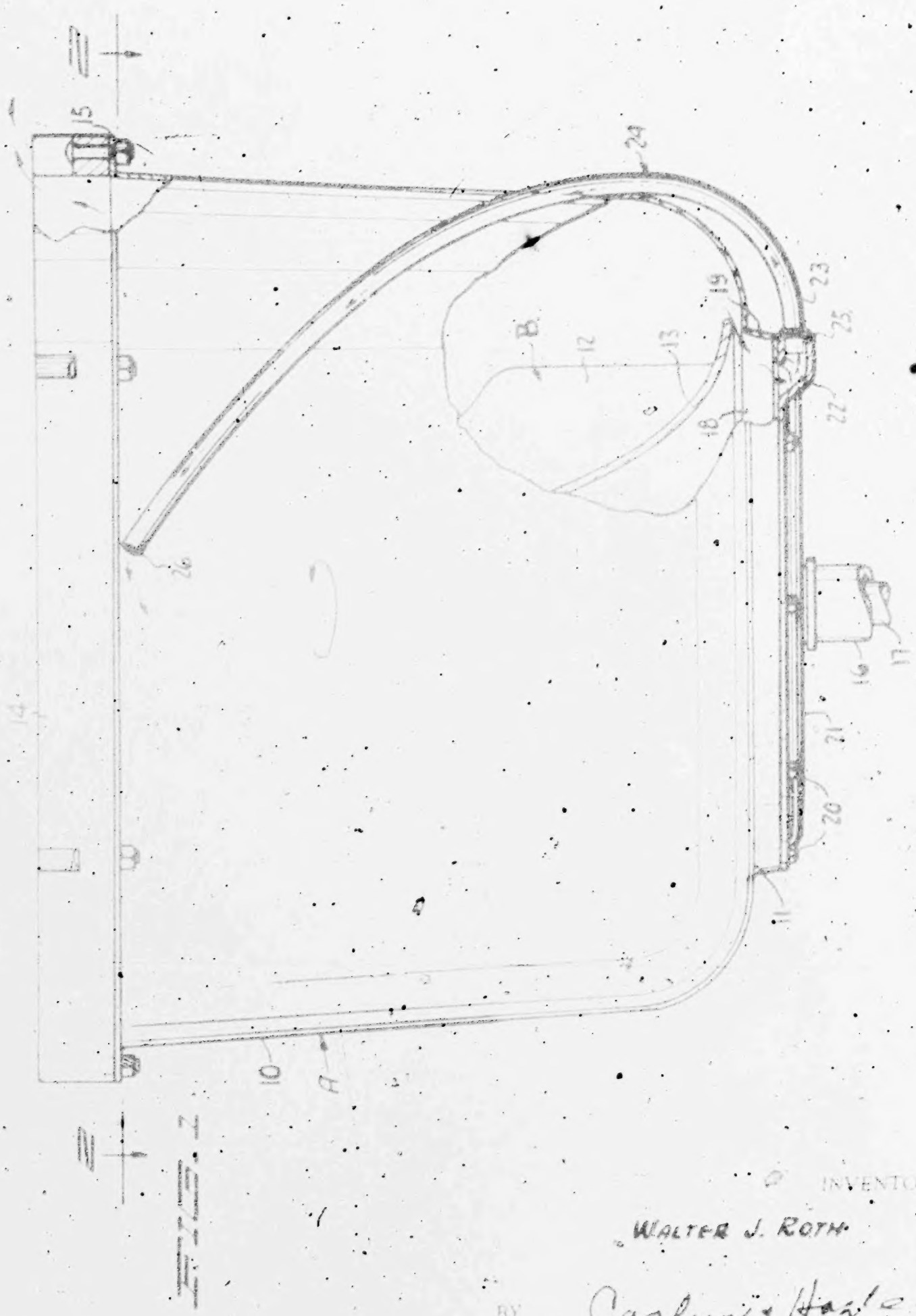
April 7, 1953 W. J. ROTH 2,633,727

WASHING MACHINE HAVING ROTARY TUB
WITH SEPARATE DISCHARGE MEANS

Filed April 29, 1952 2 SHEETS—SHEET 1



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April 7, 1953 W. J. ROTH 2,633,727

WASHING MACHINE HAVING ROTARY TUB WITH SEPARATE DISCHARGE MEANS

Filed April 29, 1952 2 SHEETS—SHEET 2

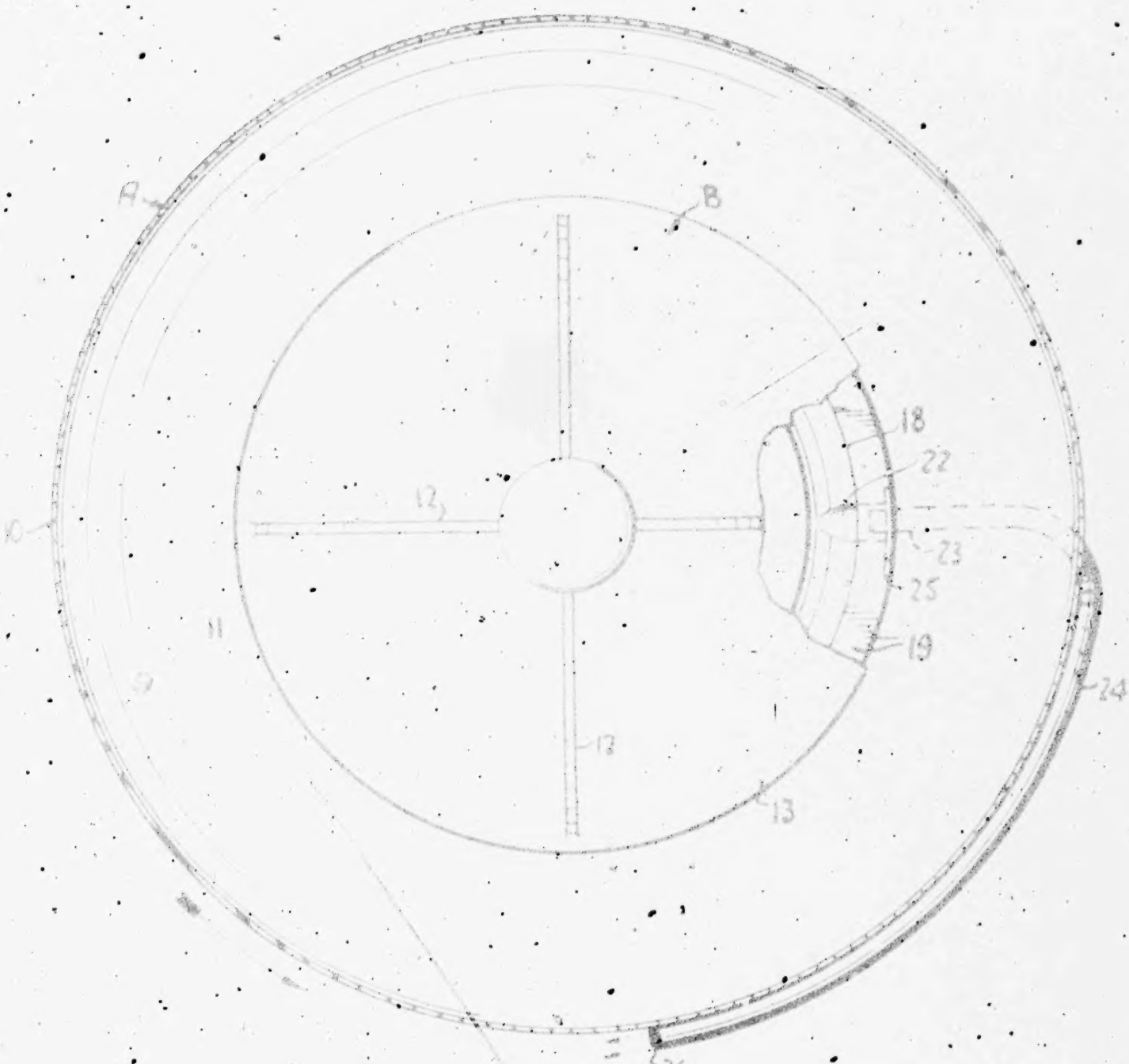

FIG. 2

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Patented Apr. 7, 1953

Plaintiff's Exhibit 7.

460

2,633,727

UNITED STATES PATENT OFFICE

2,633,727

WASHING MACHINE HAVING ROTARY TUB WITH SEPARATE DISCHARGE MEANS

Walter J. Roth, Webster City, Iowa, assignor to Solar Corporation, Milwaukee, Wis., a corporation of Delaware

Application March 29, 1952, Serial No. 279,331

3 Claims. (Cl. 68—23)

1

This invention relates to improvements in washing machines of the type wherein the clothes are washed in a tub which tub is then rotated to centrifugally expel the washing liquid and more specifically relates to improvements in the machine as disclosed in the George P. Castner Patent No. 2,476,140, issued May 17, 1949, for Washing Machine Having Rotatable Tub With Upper and Lower Discharge Means.

As set forth in detail in that patent there is a problem in machines of this general type in disposing of the accumulated settled sedimentary material which is washed from the clothes without causing this materials to contaminate the cleansed clothes. As the tub is rotated to centrifugally expel the washing liquid up over the edge of the tub there is a tendency for this sedimentary material also to move upwardly and come in contact with the clothes unless some provision is made to prevent this obviously undesirable action. In the Castner patent the bottom of the tub is provided with a recess in its bottom into which the sediment may be accumulated and trapped while washing, and this sediment trap, as it is called, is provided with separate outlets through which the sediment and a part of the washing liquid will be separately expelled when the tub is spun, without coming into contact with the clothes. In the patent furthermore these outlets take the form of tubes which extend from the outlets of the sediment trap outward and upward alongside the walls of the tub and open at their upper ends for discharging the sedimentary material and such liquid as carries it along when the tub spins. These discharge tubes act somewhat as risers and extend straight upwardly alongside the tub.

It is the primary object of my invention to improve upon this Castner construction by curving or angling the discharge tube or tubes outward and upward, reversely with respect to the direction of rotation of the tub, instead of extending the tube straight upward as in the patent. It is important to achieve a flow of water and sediment as quickly as possible through the sediment trap discharge as the tub is set in motion so that the sedimentary material will be gotten rid of at once and the "trailing" tube is found to be very advantageous in this respect. It will be understood that the cleansing liquid will stand in the tube while washing and with the tube angling outward and upward the inlet end of the tube is located in advance of its outlet end, with reference to the direction of rotation of the tub, and the spinning motion causes this water to

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flow out of the tube with what may be described as a jet effect which is very desirable.

These and other more detailed and specific objects will be disclosed in the course of the following specification reference being had to the accompanying drawings, in which—

Fig. 1 is a side elevation of a clothes washing tub with sediment trap and discharge tubes therefor according to my invention, parts of the tub being shown in section to better show the construction details.

Fig. 2 is a horizontal sectional view along the line 2—2 in Fig. 1.

Referring now more particularly and by reference characters to the drawing, A designates generally the tub of a washing machine of the agitator and extractor type, same having an annular upwardly flaring wall 10 and a bottom 11 and forming a receptacle for the clothes to be washed and the cleansing liquid therefor. An oscillating agitator B is mounted in the tub and has the usual radial vanes 12 carried by a central member which flares outwardly in the form of a skirt 13 located immediately over the bottom of the tub. The tub here shown is surmounted by an annular balancing ring 14 bolted to the outwardly turned upper flange 15 of the tub. The tub is supported and rotated by a hollow center shaft structure 16 through which there runs a shaft 17 for oscillating the agitator B. I do not, of course, limit myself to the precise tub arrangement here illustrated, it being solely for the purposes of disclosing my invention which may be applied to many different styles of tubs and washing mechanisms.

In the use of this general type of washing machine the tub is filled with cleansing liquid and the clothes to be washed and the agitator B operated for washing the clothes. When the washing cycle is completed the agitator stops and the tub is then spun rapidly on its vertical axis to centrifugally extract the liquid from the clothes. It will be noted that the wall 10 of the tub flares upwardly, or the tub increases in diameter gradually toward its top and the centrifugal action thus causes the liquid to move up inside the wall until it is discharged over the upper edge of the tub, above the normal level of liquid in the tube. The clothes are, however, retained in the tub in any usual way such as by an internal perforated ring inside the tub, but this being well known and immaterial to the present invention it is not shown. Without some means to prevent it the sediment which collects in the bottom of the tub would also move up inside the tub back

Plaintiff's Exhibit 11(a). 463

Aug. 19, 1930. A. W. ALTORFER 1,773,334

WASHING MACHINE

Filed Oct. 31, 1928

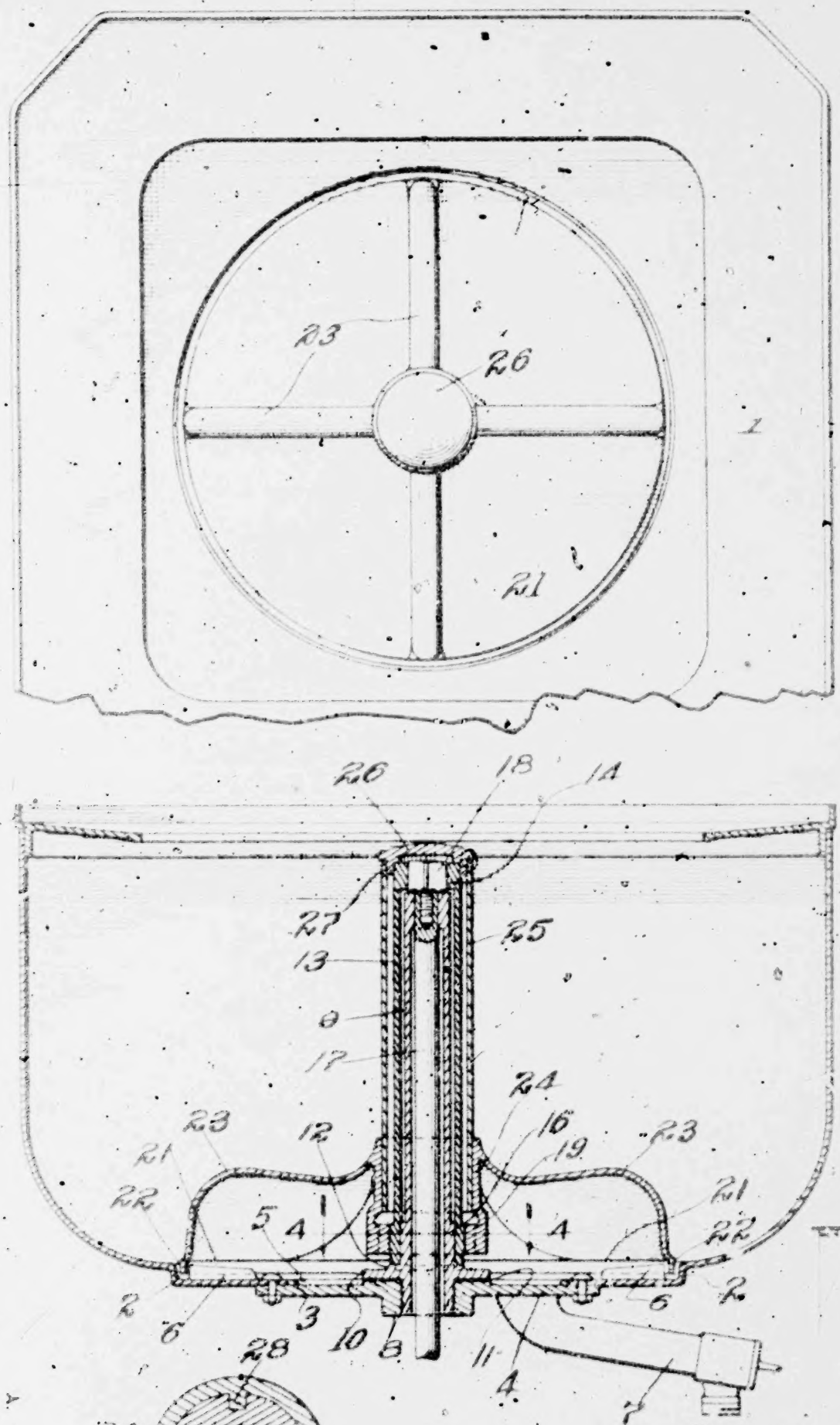


FIG. 1.

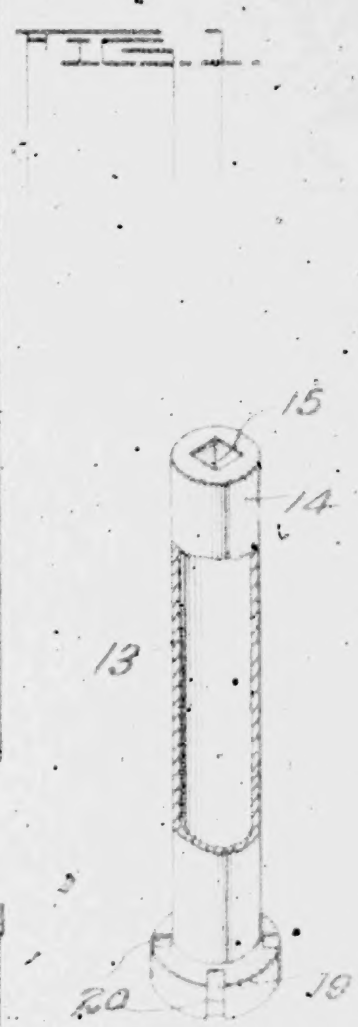


FIG. 3.

FIG. 2.

INVENTOR.

Alpheus W. Altorfer

by Parker & Burton

Attys

Patented Aug. 19, 1930 1,773,334

UNITED STATES PATENT OFFICE

ALPHEUS V. ALTORFER, OF PEORIA, ILLINOIS, ASSIGNOR TO ALTORFER BROS. COMPANY, OF EAST PEORIA, ILLINOIS, A CORPORATION OF ILLINOIS

WASHING MACHINE

Application filed October 31, 1928. Serial No. 316,147.

This invention has reference to agitators and particularly to that type employed in washing machines for domestic use.

The invention has for its principal object to improve that type of agitator structure, wherein the agitator is employed immediately above the bottom of the washing machine tub and having radially arranged upstanding wings, vanes or blades to agitate the water and articles to be cleansed, and which is provided with an upstanding tubular stem extending to a point above the normal water level in the tub and into which extends the driving shaft which passes up through the tub bottom.

An important object of the present invention, is the application of power to the agitator within the agitator and directly thereto in a plane horizontal with the plane of movement of the wings, vanes or blades thereof, thereby transferring the torque to the said wings, vanes or blades in close proximity to the actual point of the application of power, which will eliminate the torque or strain in the stem rising from the agitator body, which said torque is ever present when and in the event the application of power is applied direct to the upper end of the agitator stem.

A further object of the invention is to suspend the agitator body from the top of a floating sleeve, whereby the body of the agitator is next adjacent the tub bottom and to provide clutching means on the lower end of said sleeve and within the agitator body to operatively connect the agitator to said sleeve, the agitator being bodily and vertically movable to clutch and declutch said agitator with said sleeve; a shaft passing up through the bottom of the tub and arranged for connection with suitable power means being adapted for operative connection at its upper end with said floating sleeve.

That the invention may be more fully understood, reference is had to the accompanying drawing forming part of this description, illustrating a preferred embodiment of the invention, in which:—

Fig. 1 is a top plan view of an agitator embodying my invention within a washing machine tub, the latter partly broken away;

Fig. 2 is a vertical sectional view through the agitator and parts associated therewith, including the washing machine tub;

Fig. 3 is a perspective view, partly in section, of the floating sleeve showing the clutching means at the base thereof adapted for clutch connection with complementary means within the agitating body, and

Fig. 4 is an enlarged sectional detail, in plan, as the same would appear if taken on the line 4—4, Fig. 2.

Like characters of reference denote corresponding parts throughout the figures.

The washing machine tub is designated 1, preferably square in outline and with lower curved sides, which terminate in an off-set bottom 2 having an enlarged central opening 3 therein. A sub-bottom 4 is provided which covers the opening 3 and on the off-set bottom 2, which may or may not form a part of said sub-bottom 4, is an annular drain-ring 5 having radial passageways 6 to direct water from the tub proper over the sub-bottom 4 where it may have exit, when it is desired, through a drain-cock 7, in manner well understood. The periphery of the drain-ring 5 is spaced inwardly from the off-set bottom 2 to receive an annular depending flange of an agitator body, whereby clothing and other articles, being washed, are prevented from getting under the agitator body. This form of tub bottom and drain are not essential in the carrying out or functioning of the within described invention in agitators, but merely shows one form of structure which may be employed.

The sub-bottom 4 is provided axially with a central hub structure 8, which as will be understood, would form a part of or be associated with the tub bottom 2, were not the particular structure shown employed, and extending up from such bottom is a tubular gland 9 which preferably terminates at a point above the normal water level in the tub. The lower end of said gland is shown in this instance threaded into the hub structure 8 and with an overlying flange 10 between which and the bottom is inserted a suitable gasket 11 to provide a water seal. The upper surface of said flange 10 is pro-

vided with an off-set 12 to provide a seat for the lower end of a floating sleeve 13 which encloses the upstanding gland 9 and extends to a point above said gland and has an overlying head portion 14 formed or provided with an interiorly arranged squared or other suitably formed opening 15. The lower end of the gland 9 is provided for a short distance with an exteriorly fashioned bearing surface 16, to provide a bearing for the lower end of the floating sleeve 13 and on which it rotates.

Extending up through the tub bottom is a shaft 17, which may have operative connection with any suitable driving parts or mechanism therebeneath, not shown, and said shaft has a journal bearing within and at the top of the gland 9, and removably connected with the upper end of said shaft is a squared or other suitably formed or shaped member 18, which is adapted to have a complementary relation with the opening 15 in the floating sleeve 13, when and at the time said sleeve is telescoped into position, within the tub, and over the gland 9, which it encloses, as shown. The floating sleeve 13 is provided at or approximate its lower end with an annular hub 19, which preferably is disposed radially in the plane of the bearing surface 16 on the gland 9 and in the periphery of said hub is provided a plurality of radially disposed notches or seats 20 which form or provide elements of complementary clutch members between said floating sleeve and an agitator body, which I shall now describe.

The agitator body is preferably an annular plate member 21 provided with the flange 22 at its periphery adapted, when in operative position in the tub, to have a seating relation between the off-set in the bottom 2 and the drain-ring 5, as seen in Fig. 2. Said body is formed or provided with a plurality of upstanding wings, vanes or blades 23 which terminate centrally of the body in a depending tubular hub member 24. This structure implies an agitator which is hollowed out substantially on its underneath side, including the wings, vanes or blades and as best seen in Fig. 2, which permits the formation of the depending hub 24 within the agitator body. Extending down within this hub and brazed or otherwise suitably connected thereto is a tubular stem 25, which said stem extends from above the hub 24 and the body of the agitator to a suitable point thereabove and the open end of the stem closed by a cap 26 brazed or otherwise suitably connected thereto. This stem is of such a length, that when the agitator body is in operative position it is suspended from the upper end of the floating sleeve 13, with the body of the agitator rotatable next adjacent the tub bottom, see Fig. 2. The cap 26 is formed or provided interiorly with a shouldered portion 27 to provide a seat for the cap and stem on the floating sleeve and to space the upper end of said stem in relation to said floating sleeve. The hub 24 is provided interiorly with a plurality of radially and inwardly projecting lugs 28, which, when the agitator is placed in position are caused to enter the notches 20 in the hub of the floating sleeve 13 and thereby clutch the agitator body directly to the sleeve 13, thus power is applied directly to the agitator body and in the plane of the application or transmission of the agitation by the agitator to the body of the water and materials to be cleansed.

It will be understood that in the assembly of the parts the gland 9 has a fixed position, although it is removable, and that the shaft 17 has a bearing relation therein with the member 18 secured to the upper end of said shaft. The floating sleeve 13 has a removable telescopic relation with the gland 9 and revolves thereon, having connection with the member 18 through the complementary opening 15 in the upper end thereof. These parts in position, it is readily understood that the agitator body and its stem 25 may be easily and quickly positioned by telescoping the stem over the floating sleeve to rest thereon and be suspended therefrom and clutch connecting the complementary elements 20 of the floating sleeve and 28 of the agitator body. In like manner, but reversed, the parts may be disconnected and detached for cleaning or packing for shipment.

What I claim is:—

1. In a washing machine, in combination, a tub, a shaft extending up into the tub to a point above the normal water level in the tub, an agitator operative in a normal fixed position next adjacent the bottom of the tub and having a stem surrounding said shaft throughout the length thereof within the tub, transmission means within said stem and operatively connected with the upper end of said shaft, and means for directly connecting said transmission means to said agitator within and to the body thereof and in a plane horizontal with the plane of movement of the agitation means.

2. In a washing machine, in combination, a tub, a shaft passing up through the bottom of the tub and extending to a point above the normal water level in the tub, an agitator disposed in a normal fixed position next adjacent the body of the tub and having radially disposed upstanding agitation blades and a stem surrounding said shaft throughout the length thereof within the tub, a sleeve member within said stem, means to operatively connect said sleeve member with the upper end of said shaft, and complementary clutch parts on said sleeve member and within the body of said agitator, whereby rotative power is applied directly to the agitator in a plane horizontal with the plane of movement of its agitation means.

3. In a washing machine, in combination, a tub, a shaft passing up through the bottom of the tub to a point above the normal water level in the tub, a tubular gland providing a housing for the shaft, a water seal at the base of the gland, a driving member at the top of the shaft, a sleeve rotatable on the gland and adapted for removable driving connection with said driving member, an agitator including a body adapted when operative to be disposed next adjacent the bottom of the tub and having a stem to encase said gland and sleeve, means at the upper end of the stem whereby to suspend the agitator in operative position from the upper end of said sleeve, and complementary clutching means within the agitator body and on the lower end portion of said sleeve for rotating the agitator from the lower end of said sleeve.

4. In a washing machine, in combination, a tub, a shaft passing up through the bottom of the tub to a point above the normal water level in the tub, a tubular gland providing a housing for the shaft, a water seal at the base of the gland, a driving member at the top of the shaft, a sleeve rotatable on the gland and adapted for removable driving connection with said driving member, an agitator including a body adapted when operative to be disposed next adjacent the bottom of the tub and having a depending axially disposed hub portion, a tubular stem rising from said hub and connected therewith and providing a casing enclosing said gland and sleeve, means at the upper end of said stem whereby to suspend the agitator in operative position from the upper end of said sleeve, and complementary clutching means on the said agitator hub and on the lower end portion of said sleeve for rotating the agitator from the lower end of said sleeve.

5. In a washing machine, in combination, a tub, a shaft disposed centrally of the tub and extending up through the bottom thereof to a point above the normal water level of the tub, a non-floating agitator comprising a disk-like body operative next adjacent the bottom of the tub and having an upstanding tubular sleeve surrounding said shaft throughout the length thereof within the tub, and means to oscillate said agitator having a driving connection with the upper end of said shaft and an operative connection with the agitator within the disk-like body thereof and at a point near the lower end of said shaft.

In witness whereof, I have hereunto affixed my hand and seal this 25th day of October, A. D. 1928.

ALPHEUS W. ALTORFER.

Plaintiff's Exhibit 11 (by ... 469)

Patented June 19, 1945 2,378,392

UNITED STATES PATENT OFFICE

2,378,392

DOMESTIC APPLIANCE

Robert R. Candor, Oakwood, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application October 28, 1940, Serial No. 363,086

1 Claim. (Cl. 68—184)

This invention relates to a domestic appliance and more particularly to washing machines.

In the past it has been customary to use a plain agitator in a washing machine. A plain agitator, while simple, is not very efficient. This is due to the fact that the active surface is the same when moving in opposite directions.

It is an object of my invention to provide a more efficient agitating means for a washing machine.

It is an other object of my invention to provide an arrangement which will increase the effective water moving area on the power stroke of the agitator and which will reduce the drag on the return stroke of the agitator.

It is another object of my invention to provide means for preventing clothes from catching upon or contacting the agitator in a washing machine.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical sectional view through the casing and tub elements of a washing machine embodying one form of my invention;

Fig. 2 is a vertical sectional view through the tub of a washing machine embodying my improved form of agitator; and

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Briefly, I have shown a washing machine in which the agitator is surrounded by a perforated cage for preventing clothes from contacting the agitator. The cage is so shaped as to conform to the movement of the water in the tub which is set up by the agitator. In the second form, a similar cage is provided but, in addition, the agitator is provided with movable blades which are extended upon the downward power stroke of the agitator and retracted during the return stroke of the agitator.

Referring now to the drawings and more particularly to Fig. 1, there is shown the tub 20 of a washing machine having a casting 22 forming its bottom portion to which is fastened an inner tub member 24 and an outer tub member 26. The inner tub member 24 is flared inwardly while the outer tub member 26 is flared downwardly. Apertures 28 in the tub member 24 provide communication between the inner and outer tub members and, in addition, passages 30 are provided through the casting 22 which provide passages of greater number and area between the inner and outer tub members. These inner and outer tub members are fastened and sealed at their lower edges to the casting 22 by the screws 34. The inner end of the passages 30 are covered by a ring 32 containing the apertures 34 in its vertical wall portion.

This arrangement is for the purpose of drying the clothes by spinning the tub and particularly is so arranged that in so doing the suds will not be deposited upon the clothes. In the spinning operation the clothes are thrown by centrifugal force against the walls of the inner tub member 24 and cover the apertures 28. Water in the outer member 26 is thrown over its flanged edge by the centrifugal force and this causes water to be drawn with considerable speed through the apertures 34 and the passages 30 adjacent the bottom of the tub. Since the suds are lighter than the water, they will tend to remain closer to the center of the tub, and these suds will be drawn from the surface of the water through the apertures 34 before they will deposit upon the clothes.

The operating mechanism for the tub is driven by an electric motor 36 which is connected through a coupling 38 to clutch 66 providing a connection to a helical gear (not shown) which meshes with the helical gear 40 mounted upon a sleeve 44 surrounding the vertical shaft 42. This vertical shaft 42 is slidably mounted within the sleeve 44 which, in turn, is rotatably mounted within the housing 46. The shaft 42 and the sleeve 44 are slidably connected by the pin and slot connection 45. The upper end of the sleeve 44 is provided with a bearing 48 and a ball-type joint 50 which connects to the upwardly extending portion 52 of the tub casting 22. The upper end of the shaft 42 extends through the bearing 48 and is rigidly connected to the upper end of the bell-shaped agitator 54. In order to prevent clothes from catching upon the bell-shaped agitator 54, I provide a perforated cage 56 which generally conforms to the shape of the agitator 54 but is spaced slightly upon all sides. The lower end of this cage is provided with a curled flange 58 which forms a harmonious extension of the curved surface 60 provided in the casting 22.

The coupling 38 is connected to a shaft provided with an agitating clutch 64 and a spinning clutch 66. The agitating clutch clutches the electric motor 36 to a pinion 68 which drives a gear 70 which, in turn, drives a crank pin of a Scotch yoke drive mechanism 72 provided at the lower

end of the drive shaft 42. The drive shaft 42 has a rotatable connection with the Scotch yoke drive mechanism 72 so that when the clutch 64 is released and the clutch 66 is engaged, the helical gear which drives the second helical gear 40 can rotate the drive shaft 42 along with the sleeve 44 in order that this drive shaft 42 may rotate the agitator 54 while the sleeve 44 spins the tub 20.

When the clutch 64 is engaged and the clutch 66 is released the shaft 42 will be reciprocated in a vertical direction, thereby causing a toroidal-shaped circulation within the inner tub 24. This circulation will approximately follow the outlines of the cage 56 and the curved portions 58 and 60. The cage 56 will prevent the clothes from contacting the agitator 54 and thereby will prevent the clothes from being damaged by contact with the agitator.

In Figs. 2 and 3 I have shown a tub similarly provided with a cage for preventing clothes from contacting the agitator. The agitator has movable blades which are retracted upon the upward or return stroke of the agitator and which are extended upon the downward or power stroke of the agitator so that the water moving area of the agitator is increased upon the downward stroke while at the same time the drag is reduced upon the upward stroke.

The agitator is preferably connected to an operating mechanism similar to that shown in Fig. 1 through the medium of a vertical shaft 110 sealed by the bellows 112 to the bottom of the tub 114 which is made substantially like the tub 20. The upper end of the shaft 110 is provided with a disc 116 which is adapted to operate within a cylinder 118 provided within the agitator 120. This arrangement provides a lost motion connection between the shaft 110 and the agitator 120 since the disc 116 may move freely within the cylinder 118. This lost motion between the vertical shaft 110 and the agitator 120 is employed to operate the movable blades 122 which are arranged radially at the bottom of the agitator 120.

As better shown in Fig. 3, the blades 122 are provided with slots 124 which receive the guide screws 126 for enabling the blades to be moved radially to increase or decrease the effective area upon the bottom of the agitator 120. The inner edge of each of these blades 122 is provided with a three-pronged extension including a prong 128, each of which is curled to receive the circular tension-type coil spring 130, and a set of prongs 132 provided upon each side of the curled prong 128. These prongs 132 are held in contact with a cone-shaped cam member 134 which is fixed to the vertical operating shaft 110.

Upon the upward stroke of the vertical shaft 110, the disc 116 will move from the bottom to the top of the cylinder 118 while the agitator 120 remains substantially stationary. At the same time, the inverted cone-shaped cam 134 will move upwardly with the disc 116 and the prongs 132 will remain substantially stationary so that with respect to the cone-shaped cam 134 they will move from the large portion of the cam to the small portion. This will enable the circular spring 130 to draw the blades 122 inwardly so as to reduce the area of the bottom of the agitator 120 and particularly will reduce the outer diameter of the blades 122. This will reduce the drag of the agitator 120 in its upward movement which will be started only when the disc 116 reaches the upper end of the cylinder 118 and continues its upward movement. This continued upward movement will raise the agitator 120 until the Scotch yoke drive reaches the top of its stroke.

Upon the downward stroke of the Scotch yoke drive, its inertia will cause the agitator 120 to tend to remain in its uppermost position. This will cause the shaft 110 to lead the agitator 120 on its downward stroke so that the disc 116 will move from the top to the bottom of the cylinder 118. This lost motion movement of the shaft 110 with respect to the agitator 120 will cause a relative movement between the inverted cone-shaped cam 134 and the radial blades 122 so that the blades are cammed outwardly by the relative downward movement of the cam 134. Thus, before the agitator 120 begins to move downwardly these blades 122 are projected radially at its lower edges in order to present larger and more effective water moving area on the downward or power stroke of the shaft 110.

Thus, these blades operate as a paddle which is extended only upon the downward movement of the agitator. This provides a much more efficient and effective mechanism for moving the water in the tub and thus provides better washing conditions. The cage 136 which surrounds the agitator prevents any contact of the clothes with the agitator.

In order to spin the tub 114 after the clothes are washed, the bottom of the tub is connected to the flange 138 which is provided at the upper end of a sleeve corresponding to the sleeve 44 of the drive mechanism shown in Fig. 1. In this way, the clothes may be spun dry without the deposit of suds thereon, as explained in connection with Fig. 1.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows.

What is claimed is as follows:

In a washing machine, a liquid holding receptacle, an agitator within the receptacle, an oscillating means for oscillating the agitator, a lost motion connection between said oscillating means and said agitator, said agitator being provided with movable projecting means for increasing and decreasing its size, and means responsive to the relative lost motion movement between the agitator and the oscillating means for moving said projecting means to increase the size of the agitator in one interval of its movement and for moving said projecting means to decrease the size of the agitator during another interval of its movement.

ROBERT R. CANDOR.

Feb. 24, 1942. G. W. DUNHAM 2,274,402

ART OF MAKING VACUUM
Filed Dec. 29, 1939

Fig. 1.

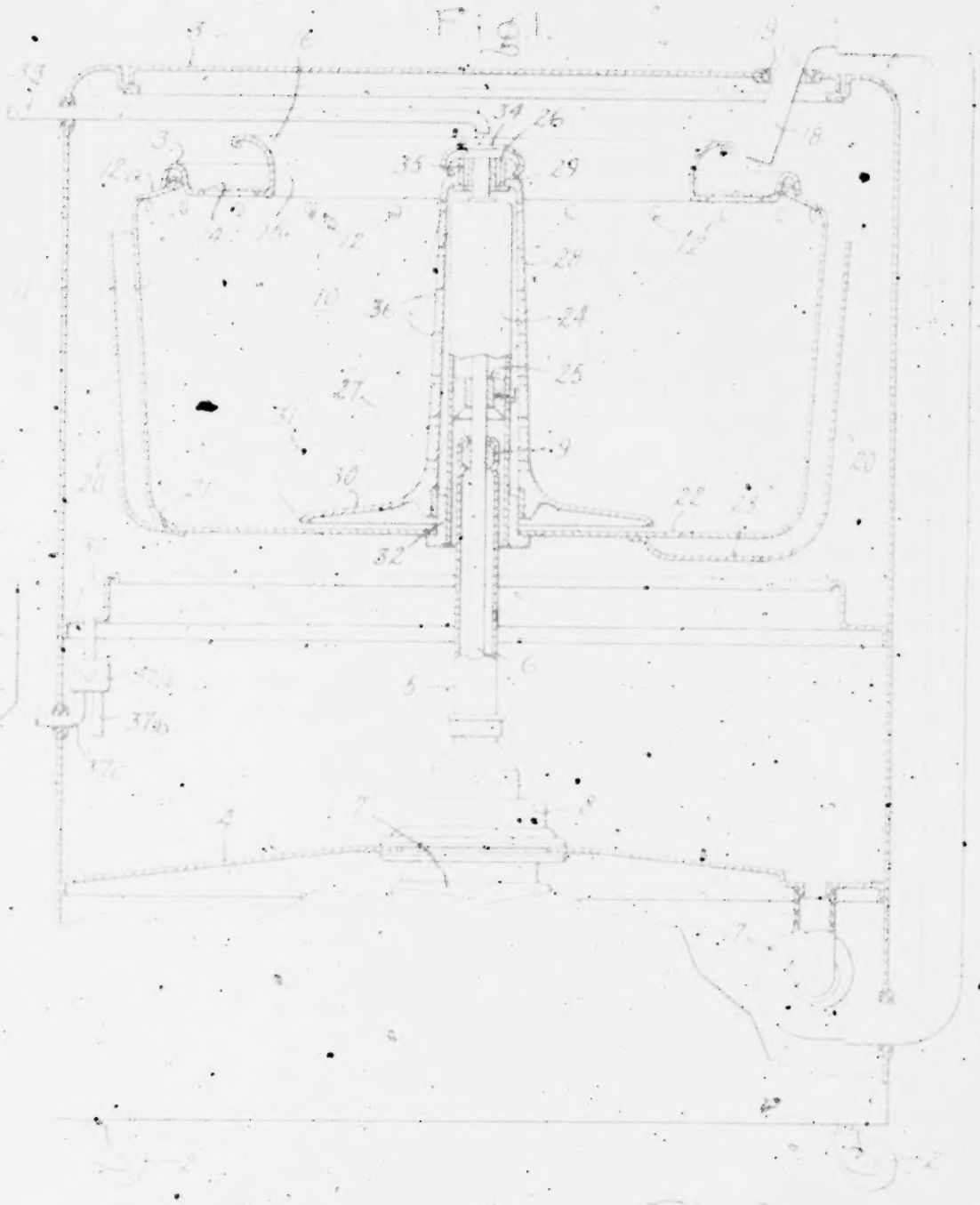


Fig. 3

Fig. 4.

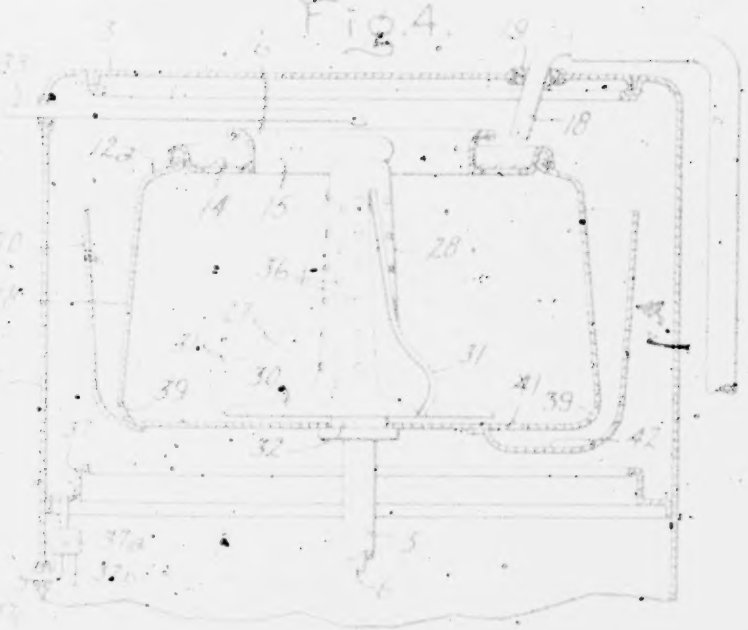
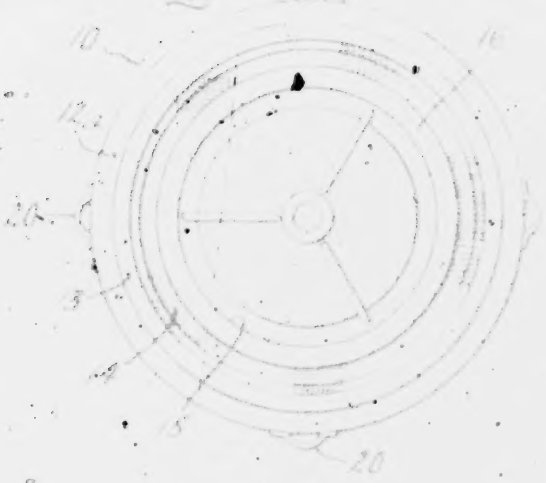


Fig. 2



Inventor:
George W. Dunham;
by Harry E. Dunham
His Attorney.

Plaintiff's Exhibit 11(d).

472

Patented Feb. 24, 1942

2,274,402

UNITED STATES PATENT OFFICE

2,274,402

WASHING MACHINE

George W. Dunham, Westport, Conn., assignor to General Electric Company, a corporation of New York

Application December 29, 1939, Serial No. 311,587

6 Claims. (Cl. 68—18)

The present invention relates to washing machines of the type in which clothes are washed and centrifugally dried in a single compartment or receptacle.

The object of my invention is to provide an improved construction and arrangement in washing machines of this type, and for a consideration of what I believe novel and my invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a sectional elevation of a washing machine embodying my invention; Fig. 2 is a top plan view of the washing compartment or receptacle; Fig. 3 is a top plan view of the agitator drive nut; and Fig. 4 is a fragmentary sectional elevation of a modification.

Referring to the drawing, there is shown a washing machine having an outer casing or tub 1 supported on casters 2 and provided with a cover 3. Extending upward from the bottom wall 4 of the casing is a sleeve 5 through which extends a vertical shaft 6 which is selectively oscillated and rotated by mechanism contained within a casing 7 supported below the bottom wall 4 of the casing. This mechanism is well understood and does not require illustration for the purposes of the present invention. A liquid-tight joint 8 is provided between the lower end of the sleeve 5 and the bottom wall of the casing. The sleeve 5 extends above the normal water level in the casing and its upper end is provided with a self-aligning bearing 9 for the shaft 6. In the upper part of the casing is a receptacle 10 having imperforate side wall 11 which flares or tapers outwardly and upwardly, and at the point of greatest flare is provided with discharge openings 12 through which the liquid is centrifugally discharged during drying. Above the openings 12 the receptacle side wall extends inwardly to form a flange 12a on the inner edge of which is seated a ring 13 supporting an annular filter 14 of fabric or mesh screen. At the inner edge of the filter is a ring 15 providing an outwardly flaring opening 16 through which clothes may be introduced or removed from the receptacle. During washing, liquid is circulated from the bottom of the casing by means of a pump 17 and discharged into the filter by a nozzle 18 extending through an opening 19 in the cover. The upper edge of the ring 15 is above the upper edge of the ring 13 so that, in case the filter becomes clogged, the liquid discharged thereon will flow over the ring 13 to the casing. The liquid flowing into the receptacle through the filter overflows from the receptacle through channels 20 formed by arcuate ribs secured to the outside of the receptacle walls, as shown in Fig. 2. Two forms of channels 20 are illustrated respectively at the left and right in Fig. 1. The upper ends of the channels 20 terminate below the discharge openings 12 and define the liquid level in the receptacle. The channels communicate with the receptacle below the liquid level through openings 21 at the junction of the side and bottom walls of the receptacle, as shown at the left in Fig. 1, and the channel at the right in Fig. 1 in addition communicates with the receptacle through an opening 22 in the bottom wall of the receptacle. During washing, liquid continually overflows from the receptacle through the channels 20 and is thereby withdrawn or discharged from the receptacle. This liquid is returned to the receptacle by the pump 17 through the filter 14. Since the liquid enters the channels 20 from the lower part of the receptacle, soap suds which collect on the top of the liquid do not interfere with the withdrawal of liquid. The continuous circulation and filtering of the liquid remove solid particles in suspension in the washing solution and keep the washing solution clean. In the construction shown at the right in Fig. 1 heavy particles, such as sand, tend to drop through the opening 22 and collect in the horizontal section 23 of the channels. These particles during centrifugal drying are kept out of contact with the clothes. In the absence of such openings, particles of sand would tend to collect on the inner surface of the clothes which line the side walls of the receptacle during centrifugal drying.

The receptacle has a hub 24 surrounding the upper end of the sleeve 5 and rotatably supported on the shaft 6 by means of a sleeve bearing 25 fixed to the inner surface of the hub and by means of a combined sleeve and thrust bearing (not shown) located between the shaft and the upper end of the receptacle hub. Splined on the upper end of the shaft 6 is a drive nut 26 for an agitator 27. The agitator has a hub 28 provided with a recess 29 at its upper end into which the drive nut 26 fits. The agitator hub extends downwardly around the receptacle hub and terminates in a disk 30 adjacent the bottom of the receptacle from which vanes 31 project. The lower end of the agitator hub is journaled on a sleeve 32 on the receptacle hub.

During washing, the shaft 6 is oscillated at a rate of the order of sixty complete oscillations a minute and through an angle of the order of 210°. Since the receptacle is journaled on the shaft 6 it remains substantially stationary during washing. During drying, the shaft 6 is rotated at a high speed and a driving connection (not shown) is established between the shaft and the receptacle so that the receptacle and agitator rotate together. Due to centrifugal force, the clothes are thrown outward against the side walls of the receptacle and the liquid therein flows up the side walls and out through the discharge openings 12 against the side walls of the casing 1 and runs

down the casing side walls into a trough 37. The trough 37 is provided with a valve 37a having discharge outlets 37b and 37c selectively discharging to the bottom of the casing 1 or to a drain. When the valve is adjusted to discharge to the casing, the liquid is stored in the bottom of the casing. During centrifugal drying, the clothes may be rinsed by liquid introduced through a pipe 33 into an opening 34 in the upper end of the agitator hub. The rinsing liquid flows downward through openings 35 in the agitator drive nut into the space between the receptacle and agitator hubs and flows outwardly therefrom through openings 36 in the side walls of the agitator hub. The openings 36 are spaced circumferentially around the agitator hub, and the rinsing liquid is accordingly uniformly sprayed over the clothes which line the receptacle side walls. The spray rinsing liquid is discharged from the openings 12 in the receptacle against the side walls of the outer casing 1 and is collected in the annular trough 37 from which it may be conducted to a drain through outlet 37c so as not to dilute the washing solution stored in the bottom of the casing. At the conclusion of the washing operation, the washing solution which has been collected in the bottom of the casing may be returned to the receptacle by the pump 17.

In the modification shown in Fig. 4 there is shown a machine equipped with a receptacle having side walls 38 which taper downwardly and outwardly, the machine in other respects being substantially the same as the machine previously described. Corresponding parts are indicated by the same reference numerals. At the point of greatest diameter the receptacle side walls are provided with discharge openings 39 through which the liquid is centrifugally discharged during drying. The liquid flowing through the openings 39 flows into channels 40 on the outside of the receptacle having walls tapering upward and outward and is discharged through the upper ends of the channels. The upper ends of the channels 40 terminate below the rim 12a of the receptacle and define the liquid level in the receptacle 38. Two forms of channels are illustrated, respectively at the left and at the right in Fig. 4. In the form of channel at the right in Fig. 4, the channel extends under the bottom of the receptacle 38 and communicates therewith through an opening 41 through which heavy particles, such as sand, fall into the horizontal section 42 of the channel. This serves the same function as the opening 22 and the horizontal section 23 in the construction of Fig. 1. During washing, the liquid overflowing the channels 40 is returned to the receptacle through the nozzle 19 on to the filter 18, as in the previously described construction. During centrifugal drying, the liquid discharged through the openings 39 flows out through the channels 40. In all other respects the construction and operation are the same as in the previously described construction.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, walls defining channels at the side walls of the receptacle, the upper ends of the channels being below the top of the receptacle and open to the outside of the receptacle to define the liqued level in the receptacle and the lower ends of the channels communicating with the interior of the receptacle below the liquid level, and means effective during washing for removing suspended particles from the liquid overflowing said channels and returning the cleaned liquid to the receptacle.

2. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, said receptacle having side walls flaring outwardly from the bottom toward the top, said side walls being provided with centrifugal discharge openings at the region of greatest diameter, and means forming passages on the side walls of the receptacle, said passages having open upper and lower ends, the upper ends being disposed outside said receptacle side walls below said centrifugal discharge openings and defining the liquid level in the receptacle and the lower ends communicating with the interior of the receptacle.

3. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, said receptacle having side walls flaring downward and outward from the top, said walls being provided with centrifugal discharge openings at the bottom, walls on the side walls of the receptacle defining passages communicating with said openings and flaring upward and outward therefrom toward the top of the receptacle and having open upper ends outside of and terminating below the top of the receptacle to define the liquid level therein, and means effective during washing for removing suspended particles from the liquid overflowing said passages and returning the cleaned liquid to the receptacle.

4. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, channels on the side walls of the receptacle flaring upward and outward from the bottom of the receptacle and having the open upper ends thereof outside of and below the top of the receptacle and defining the liquid level in the receptacle and having the lower ends thereof communicating with the bottom of the receptacle, and means effective during washing for removing suspended particles from the liquid overflowing said channels and returning the cleaned liquid to the receptacle.

5. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, an agitator in the receptacle having a vertical hollow hub with perforations in the side walls thereof and having vanes projecting therefrom, means for rotating the agitator and receptacle during centrifugal drying, and an opening at the top of the hub communicating with the interior thereof into which rinsing liquid may be introduced during centrifugal drying so as to flow out through said perforations.

6. In a combined washing and drying machine, a rotatable receptacle for receiving clothes to be washed and centrifugally dried, walls defining passages on the side walls of the receptacle, the lower ends of the passages being connected with the receptacle through openings in the receptacle bottom wall and the upper ends of the passages opening to the outside of the receptacle below the top of the receptacle to define the liquid level therein, and means effective during washing for removing suspended particles from the liquid overflowing said passages and returning the cleaned liquid to the receptacle.

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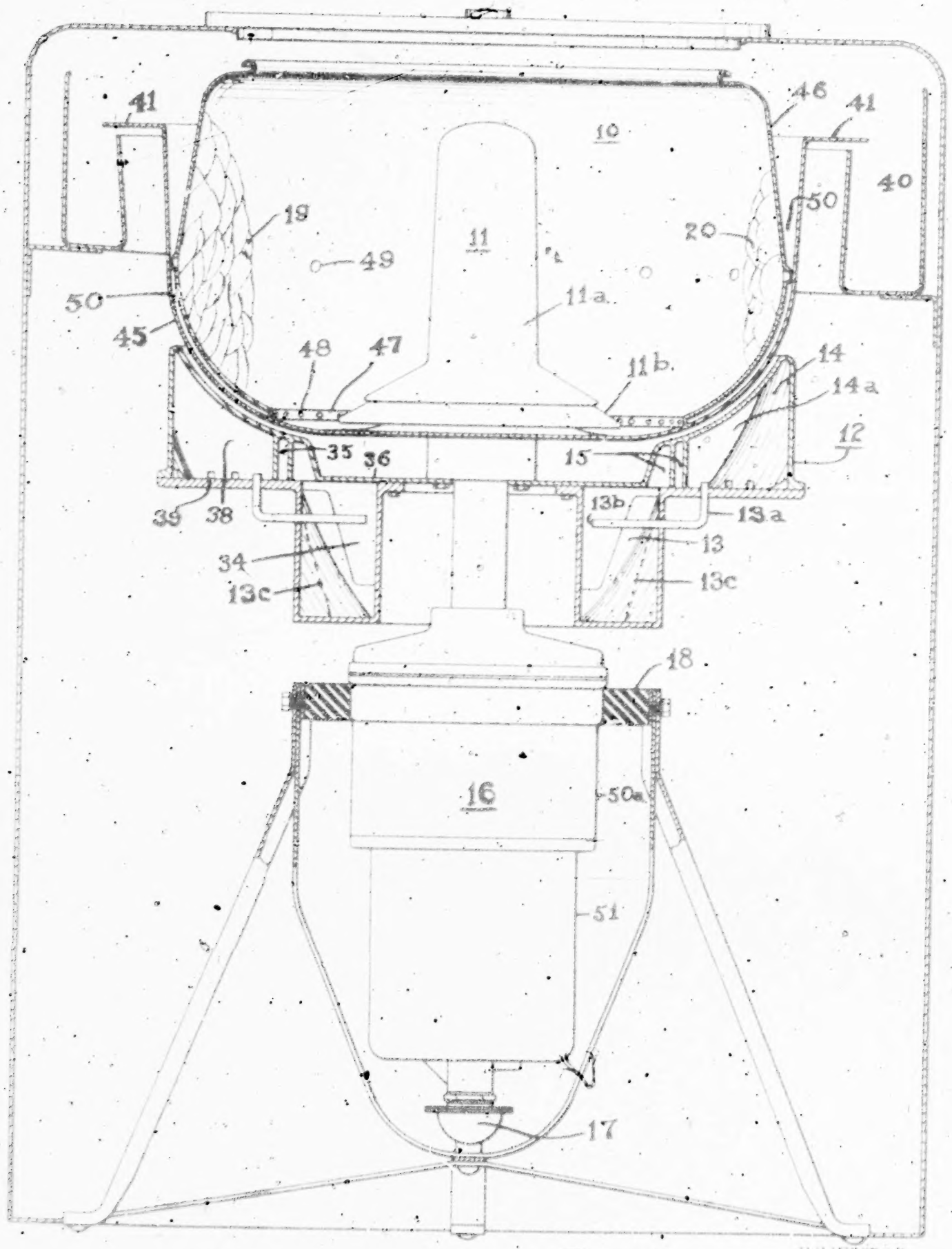
May 8, 1945. J. B. DYER 2,375,635

DOMESTIC APPLIANCE

Filed June 29, 1940 6 Sheets-Sheet 1

Fig. 1.



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DOMESTIC APPLIANCE

Filed June 29, 1940 6 Sheets-Sheet 2

Fig. 2.

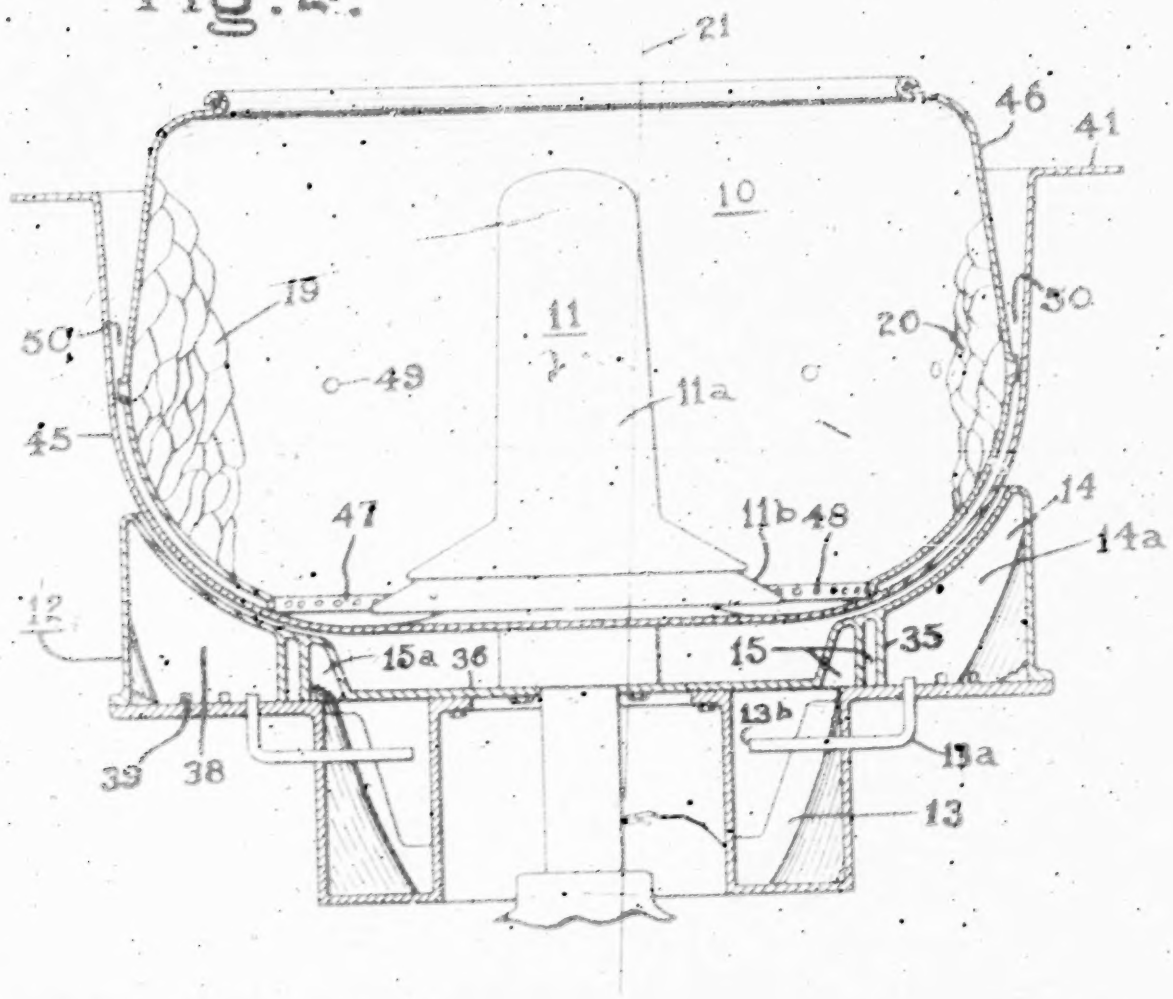
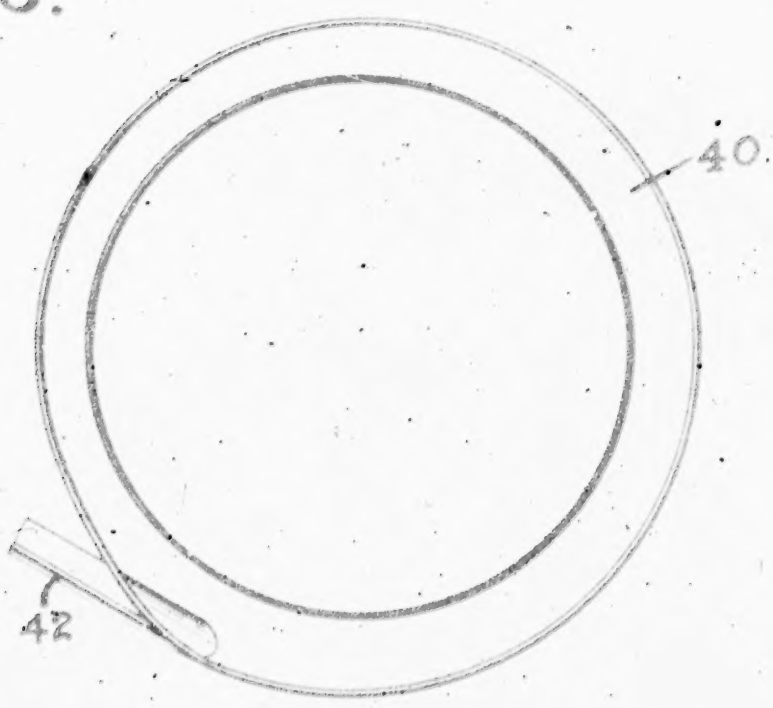


Fig. 3.



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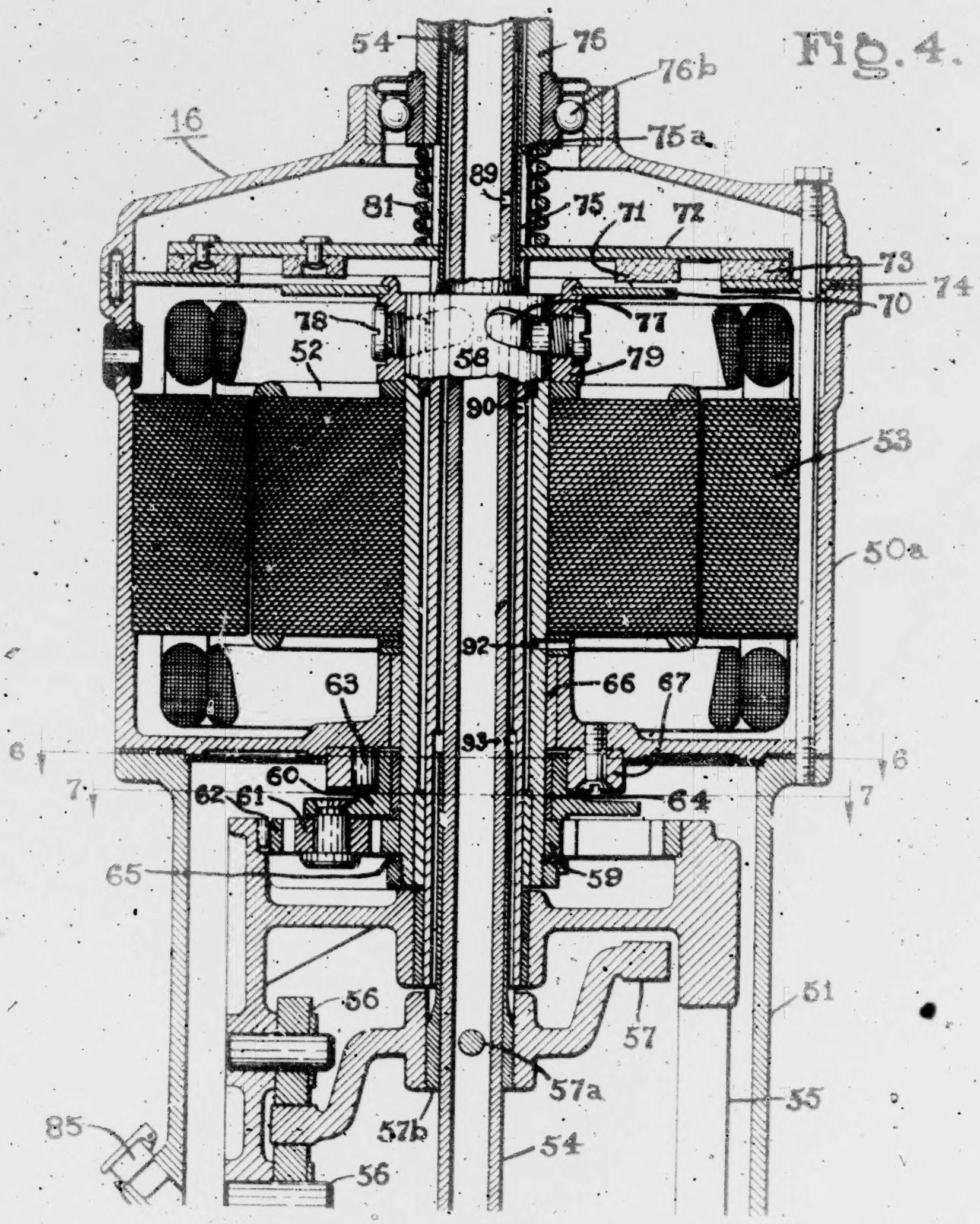
Plaintiff's Exhibit 11(e). 476

May 8, 1945. J. B. DYER 2,375,635

DOMESTIC APPLIANCE

Filed June 29, 1940 6 Sheets-Sheet 3

Fig. 4.

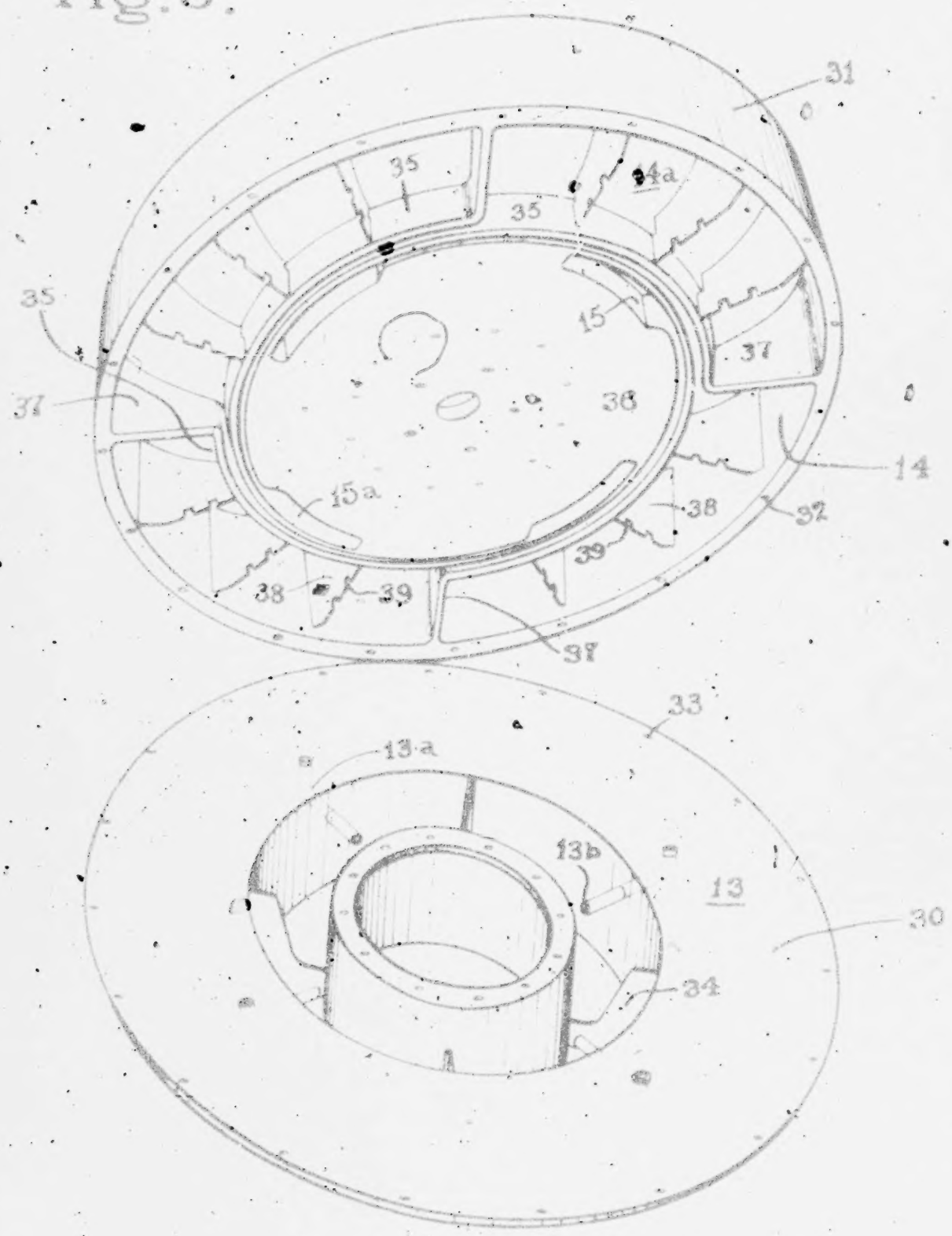


May 8, 1945. J. B. DYER 2,375,635

DOMESTIC APPLIANCE

Filed June 29, 1940 6 Sheets-Sheet 4

Fig. 5.



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May 8, 1945. J. B. DYER 2,375,635

DOMESTIC APPLIANCE

Filed June 29, 1940 2 Sheets-Sheet 2

Fig. 6.

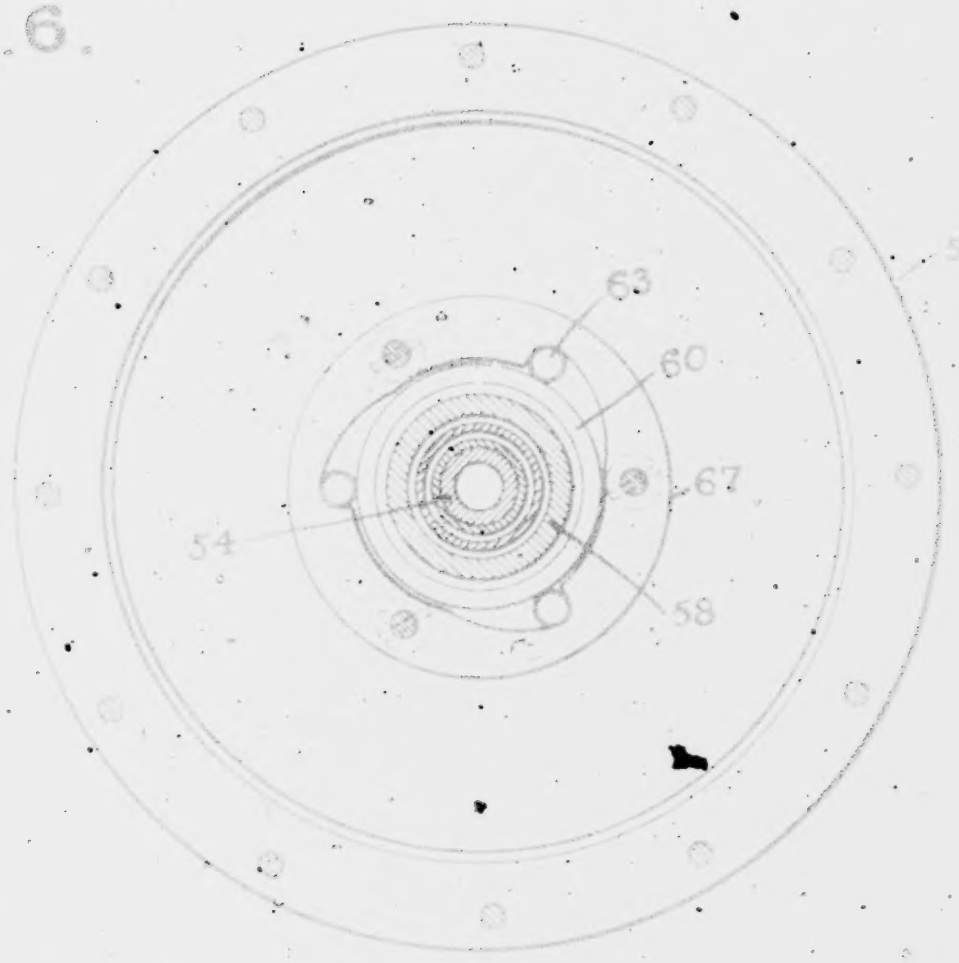
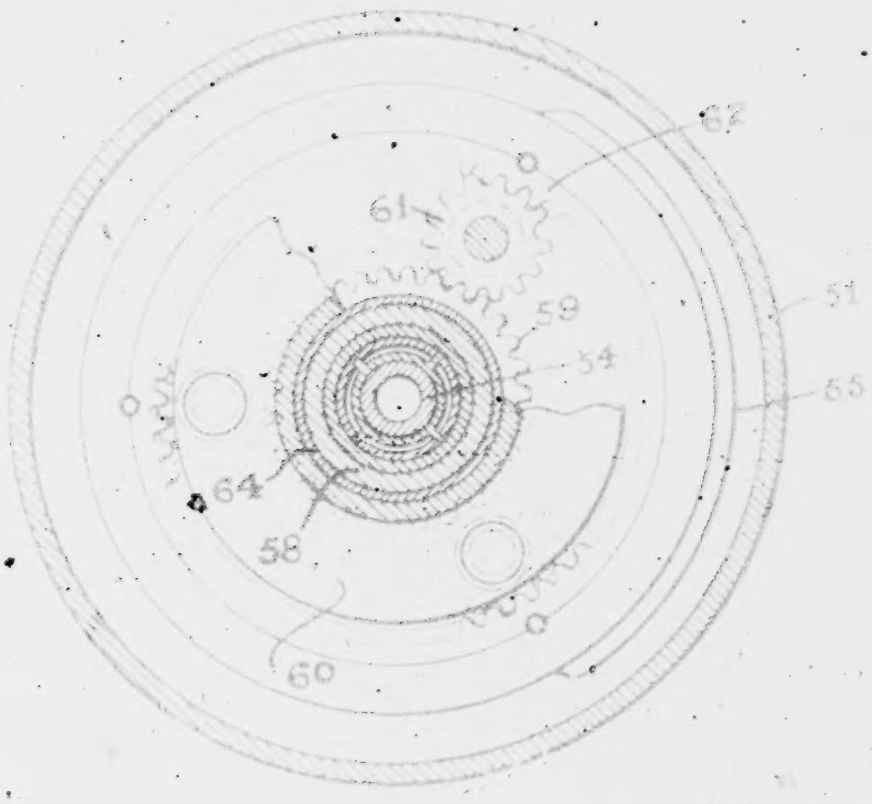


Fig. 7.



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DOMESTIC APPLIANCE

Filed June 29, 1940 6 Sheets-Sheet 5

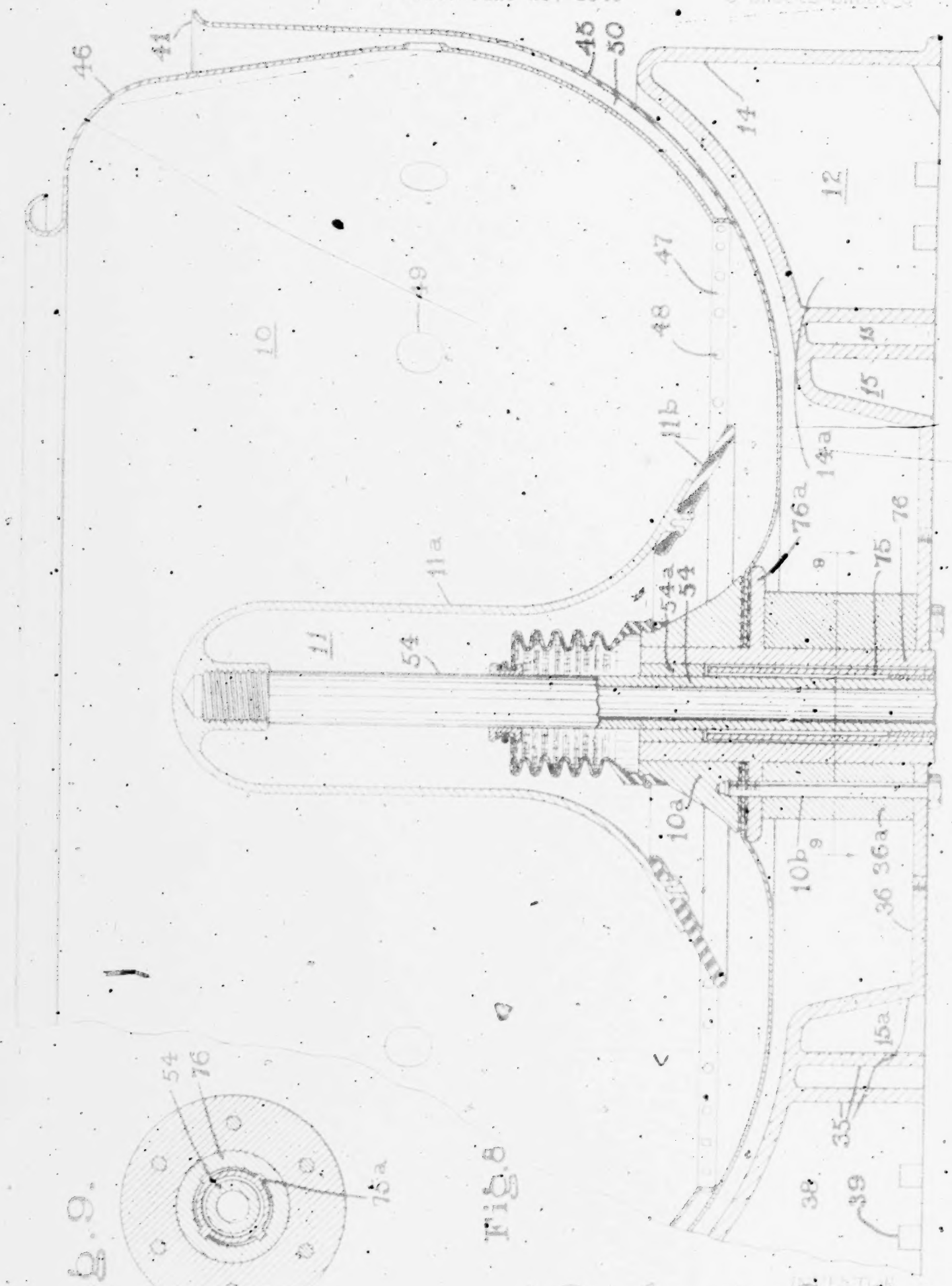

Fig. 9.

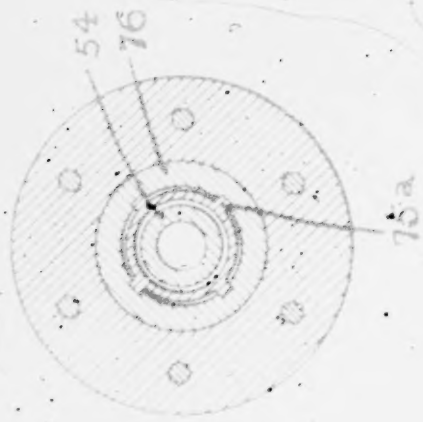

Fig. 8.

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Plaintiff's Exhibit 1 (e).

480

Patented May 8, 1945

2,375,635

UNITED STATES PATENT OFFICE

2,375,635

DOMESTIC APPLIANCE

John B. Dyer, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application June 29, 1940, Serial No. 343,206

9 Claims. (Cl. 74—573)

This invention relates to domestic appliances, and the like.

An object of this invention is to provide a method of balancing a rotating movable form-changing load, such as a rotating centrifugal clothes basket.

Another object of this invention is to provide a machine which is properly balanced while rotating, notwithstanding that it contains a movable form-changing load.

Another object of this invention is to provide a washing machine with a vertically reciprocating agitator and a centrifugally rotating tub, in such a manner that the machine may be used to wash clothes and thereafter to dry them centrifugally.

Another object of this invention is to provide a transmission for rotating the basket and vertically reciprocating the agitator.

Another object of this invention is to provide an improved trough for receiving the liquid discharged from a centrifugal basket.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a view, partly in section and partly in elevation of a washing machine embodying my invention, the view being partly diagrammatic;

Fig. 2 is a view of a portion of the machine, showing the same in the process of being automatically balanced while being centrifugally rotated;

Fig. 3 is a plan view of my improved trough;

Fig. 4 is a vertical cross-section of the transmission mechanism for imparting rotation to the tub and reciprocation to the agitator;

Fig. 5 is an exploded view of the counter-balancing device;

Fig. 6 is a horizontal cross-section taken along the lines 6—6 of Fig. 4;

Fig. 7 is a horizontal cross-section taken along the line 7—7 of Fig. 4;

Fig. 8 is an enlarged cross-sectional view of the upper part of the machine; and

Fig. 9 is a cross-sectional view taken along the line 9—9 of Fig. 8.

A washing machine embodying my invention includes a rotatable tub 10 and an agitator 11 therein, preferably vertically reciprocable. An automatic counter-balancing device 12 is attached to the machine below the tub 10 and includes a mass of counter-balancing liquid, such as water, mercury, or heavy oil or its derivatives, which is automatically distributed in the machine during the pick-up of rotation so that the same automatically balances the unbalance created by any unequal distribution of clothes within the tub.

The counter-balancing device 12 includes a receptacle 13 (see Fig. 5) and liquid pocket means 14 located above the receptacle 13. The receptacle 13 and pocket means 14 are connected by proper liquid passageways 15 in such a manner that the passageways 15 receive liquid from the receptacle 13 and distribute it to the pocket means 14 in such quantities that any unbalance in the machine tends to be correctly counterbalanced by the liquid.

The tub 10 and its driving mechanism 16 preferably are mounted on a universal joint 17 to allow a slight movement about the joint 17 as a fulcrum. The mechanism is maintained in a vertical position by the resilient rubber-like supports 18. While the tub 10 is in a stationary condition, the counter-balancing liquid held in the receptacle 13 remains in readiness to be distributed when the tub starts to rotate. When rotation is started, the clothes within the tub 10 may be in an unevenly distributed condition as indicated by the large collection of clothes 19 and the small collection of clothes 20 which are intended to indicate a ring of clothes of uneven thickness. Such an uneven distribution of clothes causes the tub to gyrate away from the normal vertical axis 21 as indicated in Fig. 2. As the speed of rotation increases, the liquid in receptacle 13 rises; but a larger quantity of liquid tends to collect on the same side of the receptacle 13 as the heavier unbalance 19. The liquid, as it continues to rise, finally overflows into the passageway 15a, on the same side as the heavier unbalance 19. This liquid then flows along the spiral passageway 15a into the pocket 14a, substantially 180° away. The liquid in receptacle 13 may not all flow into one passageway 15a, but a large portion of the liquid tends to flow to that passageway or passageways nearest to the heaviest unbalance in the load. For this reason the liquid is automatically distributed to pockets which are displaced substantially 180° away from the heaviest portion of the load; and this tends to balance the machine automatically. The passageways 15, and 15a, are so related to the receptacle 13, that when the machine stops, the liquid in the pockets 14 and 14a flows by gravity back into the receptacle 13.

As shown in Fig. 5, the receptacle 13 preferably is made of one piece with a large flange 30. The pocket means 14 and 14*a* preferably is in the form of a dome 31 which may be bolted to the flange 30 through the bolt holes 32 and 33. Radial baffles 34 are placed in the receptacle 13 to insure rotation of the liquid. The passageways 15, 15*a* are formed in the dome 31 by vertical webs 35, in cooperation with a horizontal plate 36. The pockets are divided by the radial portions 37 of the vertical webs into a plurality of pockets (4 being shown in Fig. 5). The pockets are sub-divided by baffles 38, provided with notches 39 at their lower portions, to stabilize the liquid in the pockets after it is received therein.

Air relief pipes 13*a* are provided to prevent trapping of air in the pocket means 14. These pipes 13*a* extend from the floor of the pocket means 14*a* to a point 13*b* near the inner wall of the receptacle 13 and above the normal liquid level in receptacle 13. The position of these pipes is such that air relief is afforded the pocket means 14; but liquid does not flow upwardly through them, because the terminal 13*b* is so located that such flow is prevented.

A trough 40 is placed around the centrifugal basket 10 and is adapted to receive liquid discharged over the flange 41 of the basket. The trough 40 preferably has a tangential discharge 42, and the trough is shaped with increasing cross-section as it approaches the trough 42, as shown in Fig. 3. This allows the liquid discharged into the trough to flow rotationally through the trough as it is discharged by the tub, and is more readily discharged through the tangential opening 42 without danger of overflowing the trough.

The particular construction of the tub 10, while it may be varied, preferably is as indicated in Figs. 1, 2 and 8. Thus the tub may include an outer cylindrical imperforate portion 45 within which is nested an annular shell 46. The annular shell 46 is provided with a lower flange 47 provided with openings 48 and is also provided with openings 49 approximately along the middle. The total discharge capacity of the openings 48 preferably is more than that of the openings 49. The object of this construction is to remove the scum from the washing liquid before the same has been deposited on the clothes 19, 20 during the centrifugal action. The scum is removed automatically because, as the tub begins to rotate, the liquid takes the form of a vortex, with a large amount of liquid being discharged through the openings 48 and flowing up through the passage 50 over the rim 41. The scum tends to flow along the surface of this vortex down near the openings 48 where the scum is removed along with the liquid flowing through the openings 48.

The agitator 11 preferably is of the vertically reciprocated type, and includes the metal cone-shaped portion 11*a* and the resilient, rubber-like flange 11*b* along the lower periphery. This agitator is reciprocated with short strokes of about one and one-half inches in length at about 450 R. P. M. to produce a toroidal action in the clothes and washing liquid while the tub 10 is stationary. This tends to distribute the clothes within the tub 10 somewhat evenly in a ring about the agitator 11. However, this distribution obviously is not always exactly even, and larger masses of clothes may be gathered along one side of the machine, as indicated at 19. After agitation has been completed, the agitator preferably is stopped, and the tub is rotated (along with the agitator 11), to discharge the liquid and scum through the openings 48 and 49. During the pick-up of this rotation, the liquid in receptacle 13 is automatically distributed to the pockets 14, 14*a* as previously described, in a manner to effect a substantial counter-balance of the unequally distributed clothes 19, 20.

Any suitable mechanism for actuating the agitator and rotating the tub may be used, but I prefer to use the mechanism disclosed in Figs. 4, 6, 7, 8 and 9, which is constructed as follows:

A transmission casing 50, 51 is provided and is bolted together as shown. This casing contains a motor having rotor 52 and a stator 53. This motor is reversible. When rotated in one direction, it causes the agitator shaft 54 to reciprocate vertically. When the motor rotates in the other direction, it rotates the tub 10, along with the agitator 11.

The agitator shaft 54 is vertically reciprocated by causing the motor to rotate the cage 55. This cage carries pulleys 56 which straddle a non-rotatable undulating track 57, which is fixed to the shaft 54. As the pulleys 56 rotate, they cause the track 57 to reciprocate vertically, and impart a reciprocating motion to the shaft 54 to which it is attached by means of the bolt 57*a*, passing through the bearing 57*b*.

The cage 55 is rotated by means of planetary gears. The motor shaft 58 is fixed to the sun gear 59. The sun gear 59 drives a ring 60 carrying planetary gears 61, which are meshed to the outer gear ring 62 carried by the cage 55. The planet ring 60 extends vertically inside a set of unidirectional clutches 63, such that, when the planet ring is urged in one direction, its rotation is stopped by the clutches 63; but is allowed to rotate when it is urged in the other direction. As a result, when the motor shaft 58 rotates in one direction, the planet ring 60 is held stationary with the result that the gear 59 drives the gear 62 through the planet gears 61, thus rotating the cage 55 and causing vertical reciprocation of the agitator 11.

For the purpose of facilitating construction, the planet ring 60 rides about a bearing ring 64. The sun gear 59 is pressed on the shaft 58 and is secured thereto by the nut 65. The shaft 58 rides in bearing 66 carried by the casing 50. The unidirectional clutches 63 are carried by a stationary ring 67 secured to the casing 50.

Rotation of the tub 10 is accomplished by rotation of the motor in the opposite direction. Such rotation causes the clutch plate 70 to rise into engagement with the clutch face 71 and causes the combined clutch and brake plate 72 to be lifted. This disengages the brake band 73 from the stationary brake plate 74 and allows the plate 72 to rotate along with the rotating clutch plate 70. The plate 72 is keyed to the shaft 75, which in turn is keyed at 75*a* to the tub carrying shaft 76. The shaft 76 has a tub carrying plate 76*a* to which the tub is bolted by bolts 10*b* along with the plate 36 and spacer ring 36*a*. The shaft 76 is carried by thrust ball bearings 76*b*.

The rotating plate 70 is lifted into engagement with the clutch band 71 by means of the spiral drive 77. The motor shaft 58 is provided with spiral slots 77 in which screws 78 extend. The screws 78 are carried by the vertical sleeve 79 which carries the clutch plate 70. As a result of this, when the shaft 58 is rotated in the proper

direction, the plate 70 is lifted by the well-known spiral action into engagement with the clutch band 71. The plate 72 is urged downwardly by the spring 81 to insure a driving engagement between the plate 70 and band 71 and also to bring the brake band 73 into engagement with the plate 74 when the motor is stopped or reversed. The agitator shaft 54 is held in alignment at the upper end by bearing 54a. A flexible bellows 54b, made of rubber or metal is secured to the shaft 54 and to the cone washer 10a which is held by the bolts 10b.

Proper lubrication is provided. To this end the casing 51 is provided with a lubricant cup 85, and lubricant is poured to the proper level. It flows through passages 86 into the space 87, from whence it is pumped through the valve 88 into the interior of the shaft 54 by the reciprocating action of shaft 54. This oil is pumped up to the oil hole 89 to provide proper lubrication between the shaft 54 and the shaft 75. The oil flows down between these two shafts and may pass out through the oil hole 90 for further lubrication of the parts and may be discharged through the opening 92. Other portions of the oil stream may flow down to the opening 93 and lubricate the parts of this portion of the mechanism.

The shaft 54, and track 57, are held non-rotationally, when the tub is stationary, by the brake 73, since brake plate 72 is keyed to shaft 75 which in turn is keyed to bearing 57b which is bolted to shaft 54. Thus when the brake is applied to the tub, the shaft 54 and track 57 are held non-rotationally, to enable them to be vertically reciprocated by the wheels 58 when agitation is required.

There are several characteristics of this type of machine which tend to cooperate beneficially to produce proper balance. One such characteristic is the behavior of a centrifugal machine below "critical speed." Another such characteristic is the fact that when the tub first starts to rotate it must pump the washing liquid in the tub outwardly to the flange 41, and as this requires some power, it insures a relatively long period of slow rotation below the "critical speed." Another such characteristic is that the driving clutch 70, 71 slips during the start of rotation, and this prevents an overload of the motor and further increases the length of rotation at slow speed.

A centrifugal machine of the character shown, without applicant's liquid counter-balancing means, ordinarily would have a "critical speed" of approximately the same number of revolutions per minute as the number of vibrations per minute, while not rotating, about the fulcrum 17. When such a tub rotates below the "critical speed," the tub swings outwardly in the same direction as the unbalanced load. When critical speed is reached and is passed, the tub starts to swing in the opposite direction from the unbalanced load. That is, if applicant's tub were not counter-balanced by the liquid, the tub would swing outwardly in the direction of the large collection of clothes 19 up to critical speed, and from that point on would gradually tend to swing outwardly in the direction of the small collection 20. It is during the rotation below the critical speed that applicant's counter-balancing liquid is distributed to the proper pocket means 14 and this distribution tends to prevent forward swinging of the basket at any time.

When the tub starts to rotate, the washing liquid gradually rises along the outer side of the tub until it reaches the flange 41. At this time there is a pumping action from the liquid inside of tub 46 to the flange 41. This pumping action has an increasing head to combat as the level of the washing liquid falls inside the tub 46. This pumping action also requires a substantial amount of power and this prevents the motor from accelerating the rotation of the tub for a considerable length of time. During this time, the counter-balancing liquid is properly distributed from the receptacle 13 to the pocket means 14.

The extra load imposed on the motor to accelerate the tub and also to pump the liquid out of the tub, is compensated by the construction of the clutch 70 and 71 which allows it to slip during this starting period and thus relieves the motor from too heavy a burden and at the same time further extends the period of rotation below the "critical speed." This further insures proper distribution of the balancing liquid from receptacle 13 to pocket means 14.

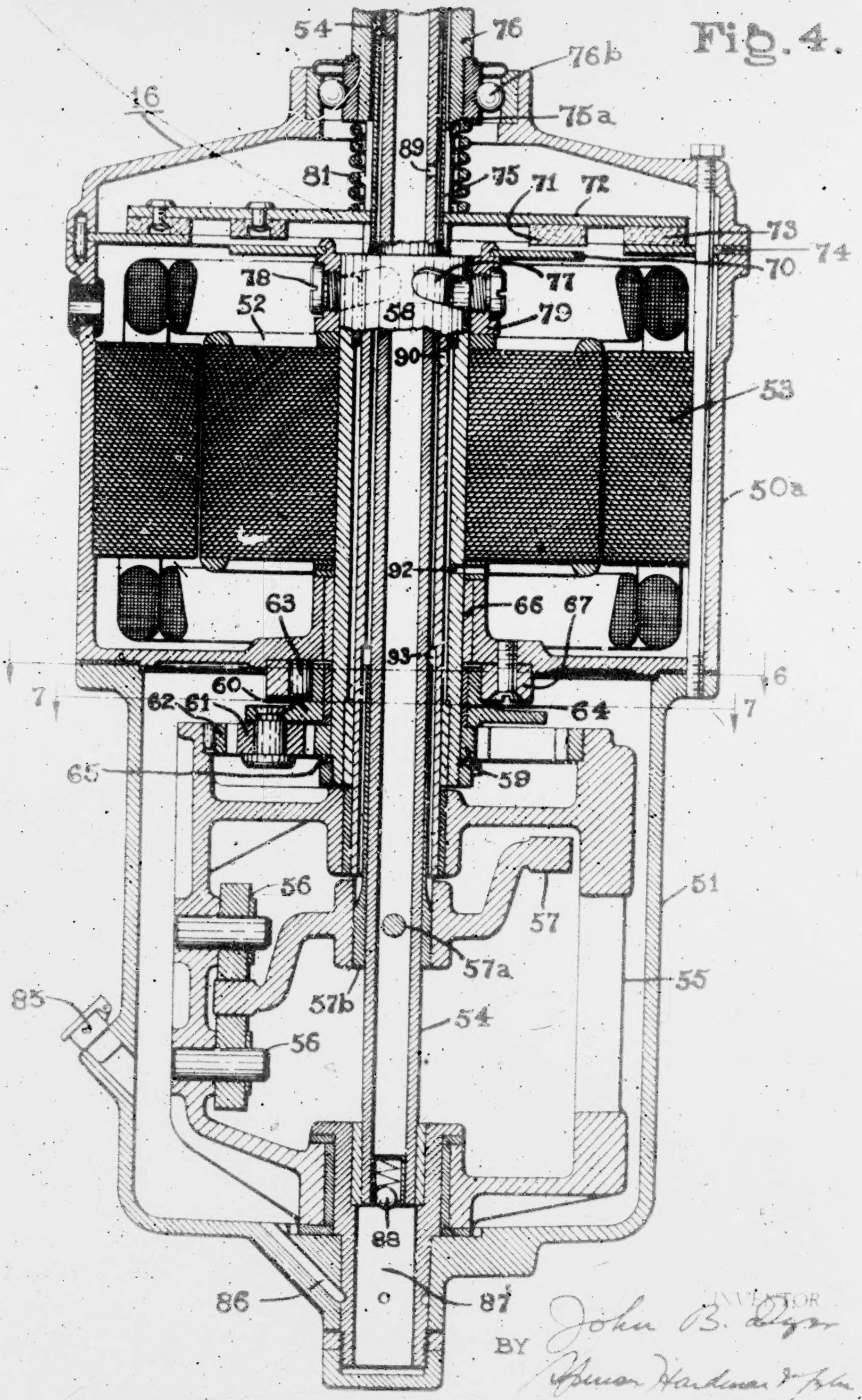
From the foregoing it is evident that the ordinary characteristic of a centrifugal basket to sway with the unbalanced load below "critical speed" cooperates with the delaying washing liquid pumping action and with the delaying slipping action of the clutch 70, 71 to insure proper distribution of the balancing liquid.

The amount of counter-balancing liquid provided in the machine should be approximately sufficient to counter-balance any expected maximum unbalanced load in the basket 46. That is, the centrifugal pull of the properly distributed counter-balancing liquid in pocket means 14 should be substantially equal to the maximum expected unbalanced load produced by unequal distribution at 19. In a machine capable of washing approximately 8 lbs. dry clothes, such maximum unbalanced load may be expected to be about 2 lbs. Therefore, the radius of the pocket means 14 and the amount of liquid distributed therein should be sufficient to counter-balance this. It is to be noted that if the clothes should be distributed more evenly than that illustrated in Fig. 1, then the counter-balancing liquid also would tend to become more evenly distributed in the pocket means 14, so that the counter-balancing liquid distributes itself automatically to compensate for any distribution of clothes in the tub 46.

While I have referred to a "critical speed" in centrifugal machines not provided with my counter-balancing means, it is to be noted that my counter-balancing means tends to eliminate "critical speed" in my machine. The reason for this is that as the tub starts to rotate, the clothes start to be distributed along the wall of the tub 46. As the speed increases, any unevenness in this clothes distribution tends to cause the tub to sway in the direction of the heaviest load. This causes a greater centrifugal force along the outer wall of the receptacle 13 nearest this unbalanced load and the counter-balancing liquid tends to rise higher at this side. The amount of sway, however, need not be very great in order to accomplish this. As the speed increases, the counter-balancing liquid rises and overflows at 15a as indicated in the exaggerated showing of Fig. 3. As this distribution of the counter-balancing liquid begins, further outward sway (which would be present in an unbalanced machine) is prevented by the distribution of liquid which continues until all of the liquid has been distributed.

While I have shown the outer wall of receptacle

Fig. 4.



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13 as vertical, it is to be understood that this wall may have the shape of a truncated cone as indicated by the dotted line 13c, the purpose of this being to insure complete distribution of the liquid in the early stages of rotation.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A centrifugal machine comprising a rotatable device to be counter-balanced, storage means for counter-balancing liquid connected to rotate with said device, liquid pocket means distributed about the axis of rotation of said device in a position to receive liquid centrifugally from said storage means, and liquid passageway means connected to said storage means and pocket means, said passageway means extending from one side of said axis to the opposite side.

2. A centrifugal machine comprising a rotatable device to be counter-balanced, storage means for counter-balancing liquid connected to rotate with said device, liquid pocket means distributed about the axis of rotation of said device above and at a greater radial distance from the axis of rotation than said storage means, said storage means having overflow means, liquid passageway means connected to said overflow means and pocket means and extending from one side said axis to the opposite side said axis to receive liquid from said overflow means during rotation and to convey said liquid to said pocket means on the opposite side said axis and to return said liquid from said pocket means to said storage means by gravity when said machine stops.

3. A centrifugal machine comprising a rotatable device to be counterbalanced, a storage receptacle for counterbalancing liquid secured to said device, liquid receiving means above said storage receptacle and having a receiving portion at a greater radial distance from the axis of rotation than said storage receptacle, overflow means on said storage receptacle, a liquid conveying coridult extending from said overflow means on one side the axis of rotation of said device to said liquid receiving means on the opposite side said axis.

4. A centrifugal machine comprising a rotatable device to be counterbalanced, a storage receptacle for counterbalancing liquid secured to said device, liquid receiving means secured to said device at a greater radial distance from the axis of rotation than said storage receptacle and connected in liquid flow relationship with said storage receptacle by means for directing the counterbalancing liquid from one side of the axis of rotation to the other, and an air relief passage connecting said receptacle and liquid receiving means.

5. A centrifugal machine comprising a rotatable device to be counterbalanced; a storage receptacle for counterbalancing liquid secured to said device, liquid receiving means secured to said device at a greater radial distance from the axis of rotation than said storage receptacle and connected in liquid flow relationship with said storage receptacle by means for directing the counterbalancing liquid from one side of the axis of rotation to the other, and a pivotal support for said machine below said storage receptacle.

6. A centrifugal machine comprising a rotatable device to be counterbalanced, a cylindrical storage receptacle for counterbalancing liquid secured to said device, circumferentially disposed liquid receiving pockets secured to said device above said storage receptacle at a greater radial distance from the axis of rotation than said storage receptacle, and conduits extending from said storage receptacle to said pockets, the inlet and outlet of each of said conduits being on opposite sides of the axis of rotation of said device.

7. A centrifugal machine comprising a rotatable device to be counterbalanced, a cylindrical storage receptacle for counterbalancing liquid secured to said device, circumferentially disposed liquid receiving pockets secured to said device above said storage receptacle at a greater radial distance from the axis of rotation than said storage receptacle, and conduits extending from said storage receptacle to said pockets, said conduits extending 90° or more around the axis of rotation.

8. A centrifugal machine comprising a rotatable device to be counterbalanced, a cylindrical storage receptacle for counterbalancing liquid secured to said device, circumferentially disposed liquid receiving pockets secured to said device above said storage receptacle, and coriduits extending from said storage receptacle to said pockets, said conduits extending 90° or more around the axis of rotation and increasing in distance from said axis from the inlet to the outlet.

9. A centrifugal machine comprising a rotatable device to be counterbalanced, a storage receptacle secured to said device for counterbalancing liquid, said receptacle having an overflow rim, means to convey liquid centrifugally overflowing a portion of said rim to a place on the opposite side of the axis of rotation of said device and means for centrifugally retaining said liquid at said place during rotation of said device.

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Plaintiff's Exhibit 11(f) 484

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DOMESTIC APPLIANCE

Original Filed Oct. 5, 1942 3 Sheets-Sheet 1

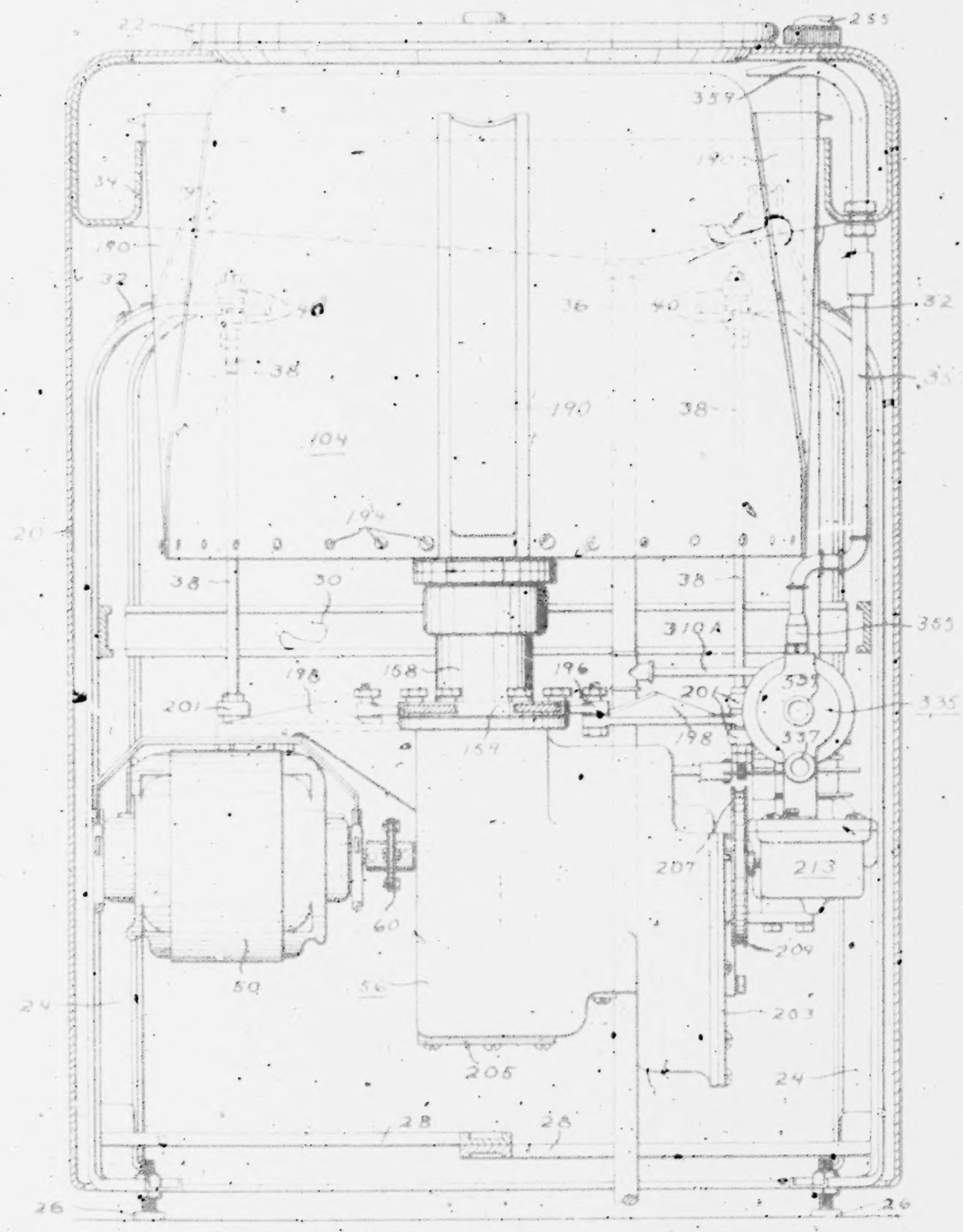

FIG. 1

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DOMESTIC APPLIANCE

Original Filed Oct. 5, 1942 3 Sheets-Sheet 2

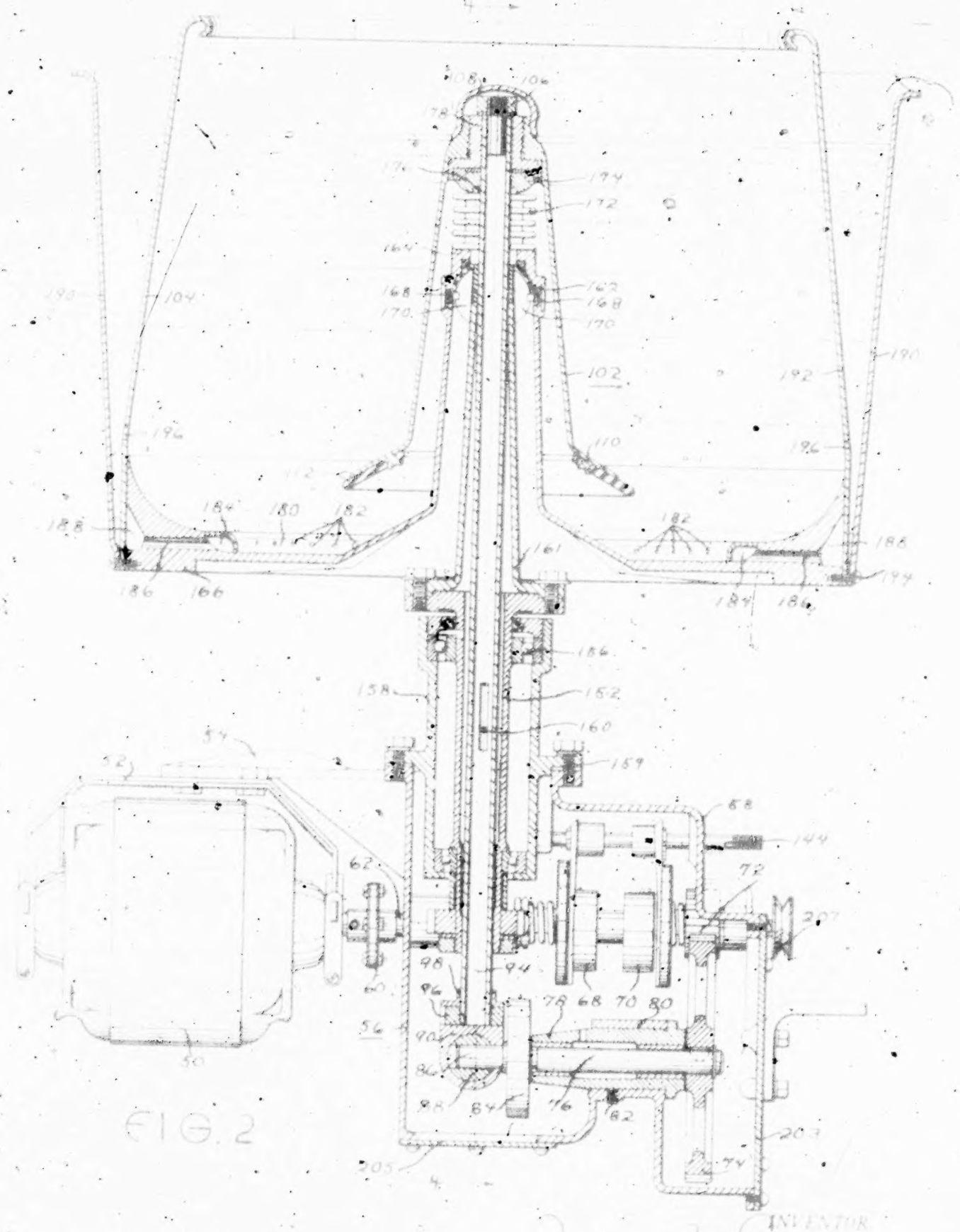

FIG. 2

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FIG 3

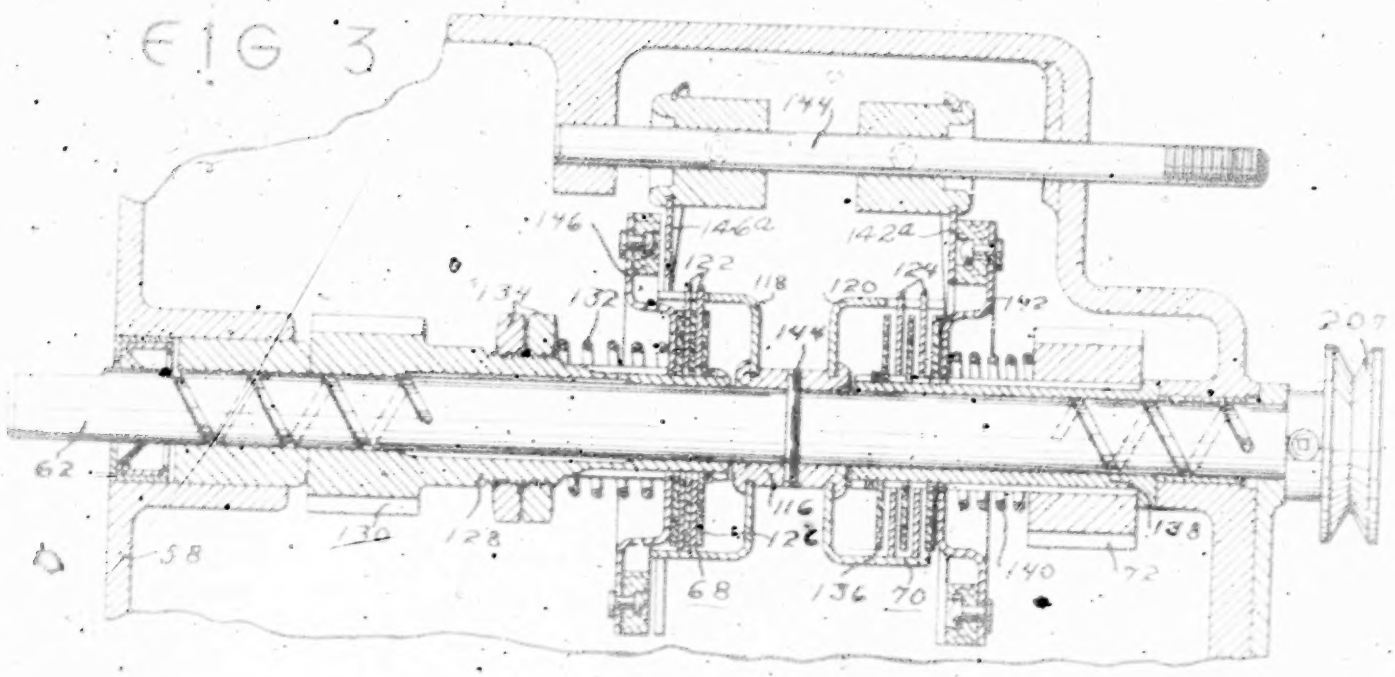
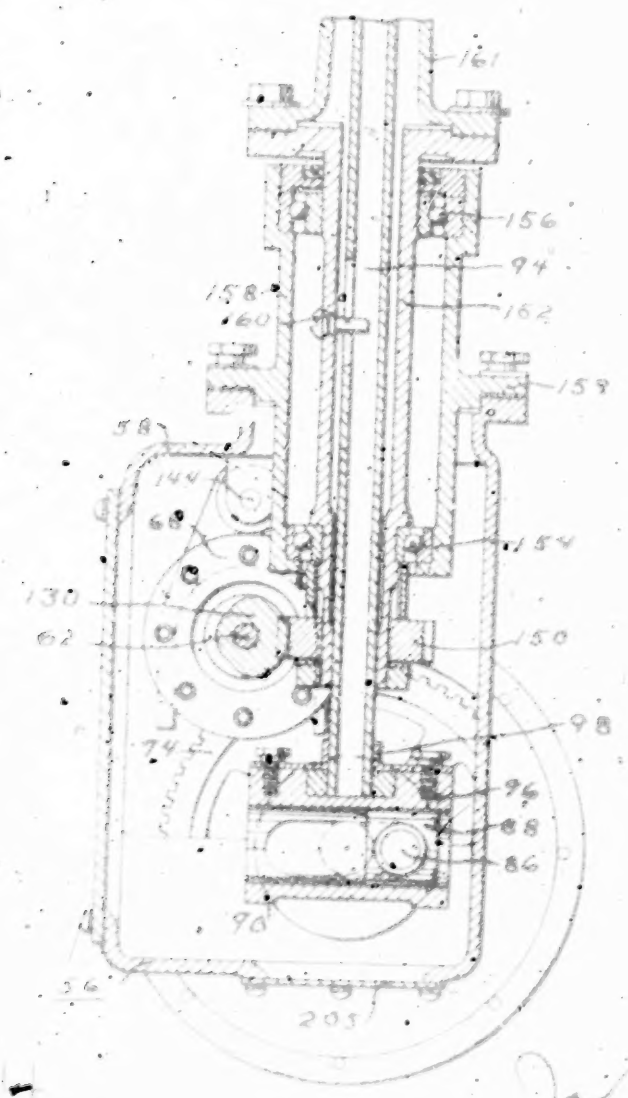


FIG 4



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Plaintiff's Exhibit 114(1)

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Patented Jan. 8, 1946

2,392,652

UNITED STATES PATENT OFFICE

2,392,652

DOMESTIC APPLIANCE

John B. Dyer, Syracuse, N. Y., assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application October 5, 1942, Serial No. 460,753, which is a division of application Serial No. 269,594, April 24, 1939. Divided and this application June 16, 1943, Serial No. 491,033

9 Claims. (Cl. 68—23)

This invention relates to a domestic appliance and more particularly to automatic washing machines and centrifugal rinsing and drying machines.

This is a division of my copending application S. N. 460,753, filed October 5, 1942, which is a division of my application S. N. 269,594, filed April 24, 1939, for Domestic appliance, now Patent No. 2,313,928.

An object of this invention is to provide a transmission for selectively imparting rotation to a tub and vertical agitation to an agitator.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a view in elevation with the casing in section of one form of an automatic washing machine embodying my invention;

Fig. 2 is a vertical sectional view of the mechanism shown in Fig. 1;

Fig. 3 is an enlarged sectional view of the clutch mechanism shown in Fig. 2; and

Fig. 4 is a sectional view of a portion of the spinning and agitating mechanism taken along the line 4—4 of Fig. 2.

Referring now to the drawings, there is shown in Fig. 1 an outer sheet metal shell 20, closed at the top by a lid 22, provided with four vertical inner frame members 24, having adjustable sliders 26 at their lower ends. These vertical frame members 24 are held in position at their lower ends by diagonal frame members 28 and at their mid-portion by arc-shaped frame members 30 which follow the contour of the outer shell 20. The upper ends of the frame members 24 are provided with brackets 32 which support a collecting trough 34 formed on the inside of the in-turned flange at the top of the outer shell 20. The collecting trough 34 is provided with a drain which includes the downwardly extending pipe 36 which connects to the sewer or other form of waste water disposal. The frame members 24 at their upper ends are bent inwardly to support the upper ends of floating supporting rods 38 for supporting of the moving parts of the washing machine. These rods are provided with thick, soft rubber vibration absorbing washers 40 on either side of the in-turned upper ends of the frame members 24. These washers are held in position by nuts threaded onto the upper ends of the rods 38.

Driving mechanism

The main moving parts of the washer are better shown in Figs. 2, 3 and 4, and include the main driving motor 50 which is supported by rubber mountings at either end. These mountings are provided upon the lower ends of an inverted U-shaped bracket member 52 which in turn is fastened to the arm 54 of a main casting 56 which includes a portion forming a crankcase 58. The main driving motor 50 has its shaft connected by a flexible coupling 60 to a clutch shaft 62 supported by the bearings 64 and 66 which are provided in opposite sides of the crankcase 58.

The agitator drive mechanism

The clutch or drive shaft 62 (Fig. 3) is provided with a spinning clutch 68 for spinning the tub and an agitation clutch 70 which connects the clutch shaft 62 to a pinion or agitator drive collar 72 which in turn drives a larger gear 74 keyed to one end of the shaft 76. The shaft 76 is rotatably mounted in a double bearing sleeve 78 which in turn is fixed within a bearing support 80 and held in position by a set screw 82. The sleeve 78 is provided with a shoulder at the end nearest the gear 74 which engages the adjacent end of the bearing support 80 in order to properly locate the sleeve 78.

The shaft 76 at the end opposite the gear 74 is provided with a heavy metal disc 84 having a crankpin 86 which extends into the piston shaped slide-member 88 of a Scotch yoke drive mechanism. The slide member 88 is received within a cylindrical member 90 formed with a slot 92 for receiving the crankpin 86. This cylindrical member 90 is connected to the lower end of agitator shaft 94. The crankcase 58 is provided with a cover plate 202 by which the sleeve 78 may be withdrawn from the bearing support 80 after loosening the set screw 82 in order to remove drive pin 86 from the Scotch yoke drive. This will allow access to the agitator rod 94 which is made possible by the closure plate 205.

In order to permit the agitator shaft 94 to rotate, it is provided with a bearing member 96 at its lower end which is rotatively mounted in a recess provided in the top of the cylindrical member 90 by a flanged plate 98. The member 96 may be welded or otherwise fastened to the bottom of the agitator shaft 94 and is free to rotate within the recess beneath the flanged opening of the plate 98. The agitator shaft 94 extends vertically upwardly and its upper end is connected to a cone-shaped agitator 102 which

is located within the tub 104. The agitator shaft 94 is hollow and is provided at its upper end with a stud upon which is threaded a clamping nut 106 for clamping the agitator hub 178 to the top of the shaft 94. The agitator 102 is threaded onto its hub 178 and has a sheet metal cap 108 providing a smooth crown for the top of the agitator 102 which covers the clamping nut 106. The agitator is somewhat in the form of a thimble and has a metal flange 110 at its lower end to which is riveted a heavy rubber flange 112.

When the driving motor 50 operates and the clutch 70 is engaged, the pinion 72 will drive the gear 74 to revolve the crankpin 86 of the Scotch yoke drive mechanism for reciprocating the agitator shaft 94 at the rate of several hundred times a minute. This agitation provides excellent washing of the clothes in the tub 104. The clothes have very little contact with the agitator or the sides and bottom of the tub so that the clothes are subjected to little wear and tear during the washing operation. For the washing operation the tub is filled to a level about the bottom of the cap 108. The construction of the clutch mechanism is better shown in Fig. 3.

The clutches

The clutches 68 and 70 are connected to the clutch shaft 62 by a tapered pin 114 which connects the sleeve 116 to the clutch shaft 62. Riveted to each end of the sleeve 116 are the cup-shaped driving members 118 and 120 which slidingly support the notched multiple disc driving plates 122 and 124 of the spinning and agitating clutches 68 and 70. The driven plates of the spinning clutch 68 are designated by the reference character 126 and are provided with teethed apertures receiving the splined sleeve or collar 128 which is rotatably mounted upon the clutch shaft 62 and is provided with the spinning helical gear 130 for spinning the tub.

When the spinning clutch is engaged as shown in Fig. 3, the driving and driven plates 122 and 126 are held together by a spring 132 which imposes a limited amount of tension upon the clutch plates through the combined clutch and brake member 146, which is slidably keyed on sleeve 128, so as to permit a slipping of the clutch at the start of the spinning operation in order to prevent too great a strain upon the driving mechanism or driving motor. This spring 132 is adjusted by the adjusting and lock nuts 134 which are threaded onto the sleeve 128. The agitating clutch 70 is also provided with driven clutch plates 136 provided with teeth engaging the splined end of the sleeve 138 which carries the agitator pinion 72. The sleeve 138 is provided with a flange for holding the agitator pinion 72 in place and the clutch spring 140 extends between the agitator pinion 72 and the combined clutch throw-out brake member 142 which is slidably keyed on sleeve 138 and is adapted to retract the spring 140 from the clutch plates 124 and 136 of the agitator clutch 70.

When the clutch throw-out and brake member 142 so retracts the spring 140, the clutch 70 is disengaged. The clutch throw-out and brake member 142 is moved to the right by the brake plate 142*a* fastened to and supported by the clutch operating rod 144 which also carries the brake plate 146*a* which cooperates with the clutch throw-out member 146 located between the clutch spring 132 and the clutch plates 122 and 126 of the spinning clutch 68. When the clutch rod 144 is moved to the right, as shown in Fig. 3, the clutch throw-out member 142 retracts the clutch spring 140 to disengage the agitator clutch 70 and the agitator drive from the clutch shaft 62 and simultaneously applies a brake action theerto. In this position, however, the spinning clutch spring 132 is permitted, through the member 146, to exert its limited tension upon the clutch plates of the spinning clutch 68 so that the helical gear 130 which spins the tub is connected through the clutch plates to the clutch shaft 62. Therefore, when the rod 144 is moved to the right, the tub 104 spins, and a brake action is imposed on the reciprocation mechanism of agitator 102. When the rod 144 is moved to the left, the agitator reciprocates, and a brake action is imposed on the rotation mechanism of the tub 104.

The spinning mechanism

The helical gear 130 meshes at right angles with a helical gear 150 mounted upon the lower end of a sleeve 152 which surrounds the agitator shaft 94. This sleeve 152 is supported by ball bearings 154 and 156 which in turn are supported by a cylindrical-shaped member 158 provided with a flange 159, by which it is fastened to the main casting 58.

The sleeve 152 is connected to the agitator rod 94 by a pin 160 which extends through a slot in the agitator rod 94 so as to permit the agitator rod 94 to reciprocate independently of the sleeve 152 and to cause the rod 94 to rotate with the sleeve 152. The upper end of the sleeve 152 is provided with a flange to which is bolted a flanged tapered member 161 which extends upwardly into a recess formed in the bottom of the tub and is provided with a ball-shaped upper end portion. Resting on this ball-shaped upper end portion is a ball-shaped hard rubber washer 162 upon which rests a socket portion 164 of the bottom casting 166 of the tub 104. This socket portion 164 is provided with a pair of screws 168 which have projections formed on their ends entering into slots 170 provided in the ball-shaped portion at the upper end of the member 160. The projecting portions of the screws 168 provide the driving engagement between the member 160 and the bottom 166 of the tub 104. The screws 168 also hold the hard rubber washer 162 in the socket 164 of the bottom 166 of the tub 104.

In order to seal the upper end of the member 160 as well as the agitator shaft 94 there is provided a bellows type seal member 172 of properly compounded rubber or some other rubber-like material such as "Duprene" or "neoprene." The lower end of the seal member 172 is provided with a heavy ring which is held between the hard rubber member 162 and the flange of the socket portion 164. The upper end of the seal member 172 is also provided with a ring portion 174 which is clamped between a metal ring 176 which fits tightly upon a reduced portion of the agitator shaft 94 and an agitator mounted member 178 which also fits upon the reduced upper end portion of the agitator shaft 94 and is held in place by the nut 106. The agitator 102 together with its cap 108 form an assembly which is threaded onto the member 178 after the assembly of the washing machine. The bottom 166 of the tub 104 is formed of a heavy cast metal, such as cast iron, zinc or brass and has a conical upwardly extending portion which surrounds the member 160 and is located within the confines of the agitator so that the ball and socket connection may be placed at the proper point so as to provide an inherent balance of the tub in order

that the spinning of the tub may be started without serious vibration. The bottom of the tub is weighted around the rim in such a fashion that no matter how an ordinary quantity of clothes is distributed within the tub, the tub will assume a position so as to compensate for any unbalance.

Water and suds disposal

I have found in most forms of devices of this type that when clothes are dried by spinning, the suds are deposited upon the clothes and thus a thorough rinsing is not accomplished. I have found by constructing and draining the tub in the manner disclosed herein that the deposit of suds may be avoided. My method of accomplishing this is to cause the removal of the water from the central portion of the tub while the tub is being spun. I find that under such conditions the clothes remain against the outer side of the tub while the water bearing the suds remains and is drawn from the central portion of the tub, since the suds are lighter than the water or the clothes. For doing this I provide an angular insert 180 in the bottom of the tub which is provided with a number of comparatively large holes arranged in a circle about midway between the rim and the center of the tub and provide the major outlet from the tub. These holes, designated by the reference character 182, may be of any suitable number and size such as 24 three-eighths inch holes.

Beneath the insert 180 there is provided a passage 184 through which water flows to four sets of passages 186 which extend through the edge of the bottom 166 and connect to a recess 188 formed at the bottom of each of the four vertical risers 190 which are fastened upon the outside of the sheet metal side wall 192 of the tub 104 at four evenly spaced positions. The side wall 192 and the riser 190 are fastened to the bottom 166 of the tub by the screws 194 and this joint is sealed by a suitable gasket. The side walls 192 are tapered inwardly as they extend upwardly from the top of the bottom member 166. This taper is preferably at an angle of from 7 to 10 degrees. A few small holes 196 are provided through the side walls 192 at the bottom of the tapered portion and located at four different portions of the wall so that they communicate directly with the passage provided by each of the risers 190. These holes are quite small and have a much smaller capacity than the holes 182 and 186. These smaller holes are provided for removing the small portion of the water which cannot readily be removed through the outlets 182 after the major portion of the water has been removed.

The water is drawn through the outlets 182 and 186 and up the risers 190 by centrifugal force since the risers 190 are tapered outwardly and have a spout which overhangs the collecting trough 34. These passages form a centrifugal pump which rapidly expels the water from the tub into the trough from which it flows down through the pipe 36 to the drain. This method of removing water also provides an excellent means for removing the sand and dirt which does not remain in suspension in the water but which collects in the bottom of the tub adjacent the holes 182. The rapid movement of the water from the tub out through the holes 182 carries the sand and dirt with it and so cleans the bottom of the tub. Instead of the four risers 190, the metal may continue around the tub 104 to form a single tub-shaped riser.

Floating support

The flange 160 is provided with arms 196 which are connected to links 198 which in turn connect to the lower ends of the supporting rods 38 provided with rubber mountings 201 above and below the links 198. This provides a floating mounting for the tub and its driving mechanism so that during the spinning operation the entire mass can rotate about its center of gravity with considerable freedom.

Automatic controls are provided and are specifically described in my said applications to which reference is made for a more detailed description. Parts of these controls are shown in Fig. 1 and are numbered 213, 337, 335, 339, 355, 357, 359. The function and operation of these parts are not immediately pertinent to the subject matter of this application and hence are not herein described.

When the automatic control actuates the shaft 144 to the right (Fig. 3) the agitator clutch 70 is released and the spinning clutch 68 is engaged. The tension of the clutch spring of the spinning clutch 68 is such that it will allow considerable slippage before the helical gear 130 will begin to turn and rotate the helical gear 150 and the tub 104. This will prevent too great a strain upon the motor and the mechanism which rotates the tub 104. The universal type of suspension for the tub 104 will prevent vibration during the accelerating period and after the tub gets up to speed the floating support provided by the rods 38 will allow the mechanism to rotate about its center of gravity and thereby will prevent destructive vibration. The spinning or rotation of the tub will then cause the flow of water out of the tub through the holes 182 and the risers 190 into the collecting trough 34 and the drain pipe 36. Thus in this way, after the clothes have been agitated or washed, this wash water is removed from the tub by this spinning operation. When the automatic control actuates the shaft 144 to the left, the agitator clutch 70 is engaged to cause vertical agitation of agitator 102, while the spin clutch 68 is disengaged and a brake action is imposed thereon to maintain the tub 104 stationary during the agitation period.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims.

What is claimed is as follows:

1. A washing machine comprising a rotatable tub, a vertically reciprocable agitator in said tub, a motor, a transmission mechanism connecting said motor, tub and agitator and including a rotatable sleeve connected to said tub, a vertically reciprocable shaft connected to said agitator, mechanism to permit concurrent rotation of said agitator and tub and permit vertical reciprocation of said agitator independently of said tub, driving connections between said motor, sleeve and shaft including rotating mechanism to rotate said sleeve and reciprocating mechanism to reciprocate said shaft, means to prevent operation of said reciprocating mechanism while rendering effective said rotating mechanism and to apply a braking action to said rotating mechanism while rendering said reciprocating mechanism effective.

2. A washing machine comprising a rotatable tub, a vertically reciprocable agitator in said tub, a motor, a transmission mechanism connecting said motor, tub and agitator and including a rotatable sleeve connected to said tub, a vertically

reciprocable shaft connected to said agitator, a Scotch yoke at the lower end of said shaft, a horizontal gear at the lower end of said sleeve, and mechanism connecting said motor, Scotch yoke and gear selectively to rotate said gear to rotate said sleeve and tub while preventing vertical reciprocation of said agitation or to operate said Scotch yoke to reciprocate said shaft and agitator while applying a braking action to said sleeve and tub.

3. A washing machine comprising a vertical rotatable sleeve to be connected to a rotatable tub, a vertically reciprocable shaft to be connected to an agitator, said sleeve and shaft being coaxial, a horizontal gear connected to said sleeve, a Scotch yoke connected to said shaft, a motor, a horizontally disposed drive shaft connected to said motor, a worm drive collar slidably mounted on said drive shaft in engagement with said horizontal gear, an agitator drive collar slidably mounted on said drive shaft, speed reduction mechanism connecting said agitator drive collar and Scotch yoke, and mechanism selectively engaging said drive shaft to either one of said collars while applying a braking action to the other or said collars.

4. A transmission comprising a vertically disposed rotatable tub sleeve, a vertically disposed vertically reciprocable agitator shaft, said sleeve and shaft being coaxial, a motor, a horizontal drive shaft connected to said motor, a horizontal spin collar slidably mounted on said drive shaft and drivingly connected to said tub sleeve, a horizontal agitation collar slidably mounted on said drive shaft and drivingly connected to said agitator shaft, clutch means selectively drivingly connecting said horizontal drive shaft to said spin collar and agitation collar, and brake means for one of said collars applicable while the other collar is connected to said drive shaft.

5. A transmission comprising a vertically disposed rotatable tub sleeve, a vertically disposed vertically reciprocable agitator shaft, said sleeve and shaft being coaxial, a motor, a horizontal drive shaft connected to said motor and extending adjacent said tub sleeve, a horizontal spin collar slidably mounted on said drive shaft and having a spiral gear thereon, a horizontal gear wheel secured to said tub sleeve and meshing with said spiral gear, a horizontal agitation collar slidably mounted on said drive shaft, speed reduction mechanism connected to said agitation collar, vertical reciprocation mechanism connected to said agitator shaft and to said speed reduction mechanism, clutch mechanism selectively connecting said drive shaft to said spin collar and agitation collar selectively to rotate said tub sleeve and reciprocate said agitator shaft, and brake means for one of said collars applicable while the other collar is connected to said drive shaft.

6. A transmission comprising a first named rotatable sleeve and a longitudinally reciprocable shaft coaxially disposed about a first named axis, a rotatable drive shaft axially disposed about a second named axis, a spin collar slidably mounted on said drive shaft and drivingly connected to said first named rotatable sleeve, a reciprocation collar slidably mounted on said drive shaft and drivingly connected to said agitator shaft, clutch means selectively drivingly connecting said drive shaft to said spin collar and reciprocation collar, and brake means for one of said collars applicable while the other collar is connected to said drive shaft.

7. A transmission comprising a rotatable sleeve and a longitudinally reciprocable shaft coaxially disposed, a rotatable drive shaft, a spin collar slidably mounted on said drive shaft and drivingly connected to said rotatable sleeve, a reciprocation collar slidably mounted on said drive shaft and drivingly connected to said agitator shaft, clutch means selectively drivingly connecting said drive shaft to said spin collar and reciprocation collar, and brake means for one of said collars applicable while the other collar is connected to said drive shift.

8. A transmission comprising a rotatable sleeve member connectible to an object to be rotated and a longitudinally reciprocable shaft member connectible to an object to be reciprocated, said members being coaxially disposed, a rotatable drive shaft, rotary mechanism drivingly connected to said rotatable sleeve member, rotary-reciprocation mechanism drivingly connected to said reciprocable shaft member, clutch means selectively drivingly connecting said drive shaft to said mechanisms selectively to drive said rotatable sleeve member and said reciprocable shaft member, and brake means effective upon one of said members while the other of said members is selectively driven.

9. A transmission comprising a first named rotatable sleeve member and a longitudinally reciprocable shaft member coaxially disposed about a first named axis, a rotatable drive shaft axially disposed about a second named axis, a first named spiral gear on said first named rotatable sleeve member, a Scotch yoke mechanism drivingly connected to said reciprocable shaft member, a rotation collar slidably mounted on said drive shaft and having a second named spiral gear meshing with said first named spiral gear, a reciprocation collar slidably mounted on said drive shaft and drivingly connected to said Scotch yoke mechanism clutch means selectively drivingly connecting said drive shaft to said rotation collar and reciprocation collar to drive said rotatable member and reciprocable shaft member respectively, and brake means effective on one of said members while the other member is being driven.

JOHN B. DYER.

Nov. 25, 1941. E. W. FORNEY 2,264,202

WASHING MACHINE,

Filed April 11, 1940 2 Sheets-Sheet 1

Fig. 1.

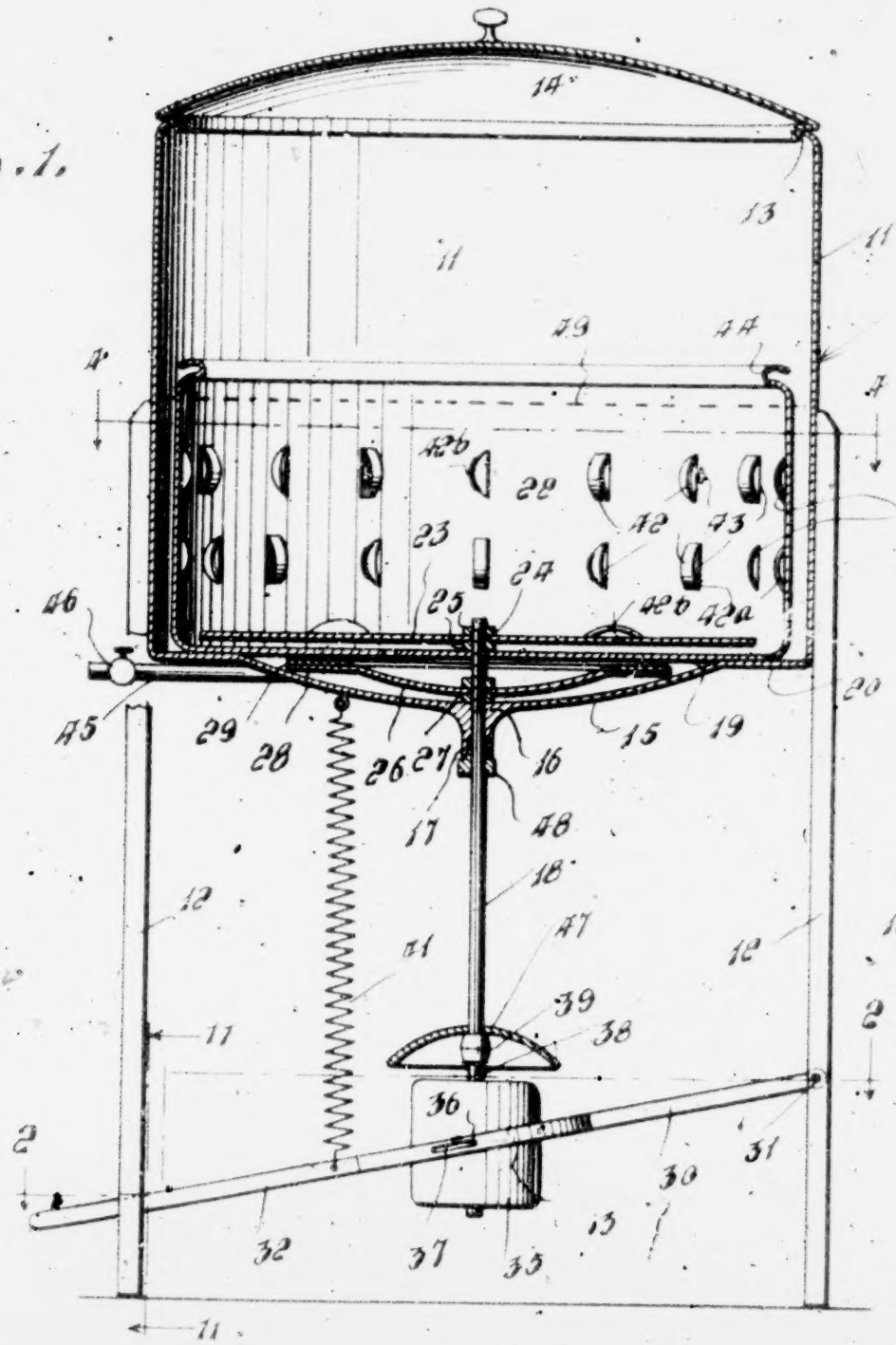


Fig. 11.

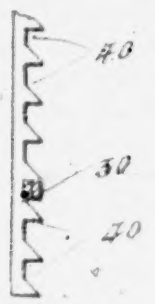
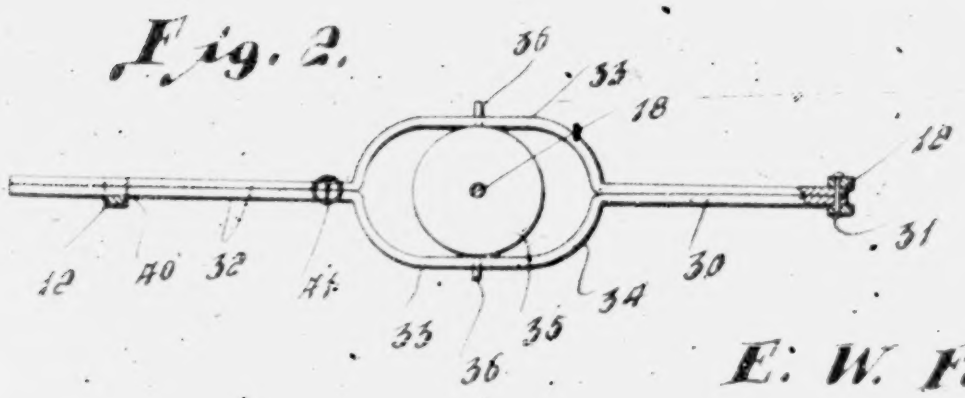


Fig. 2.



Inventor

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Nov. 25, 1941. E. W. FORNEY 2,264,202

WASHING MACHINE

Filed April 11, 1940 2 Sheets-Sheet 2

Fig. 3.

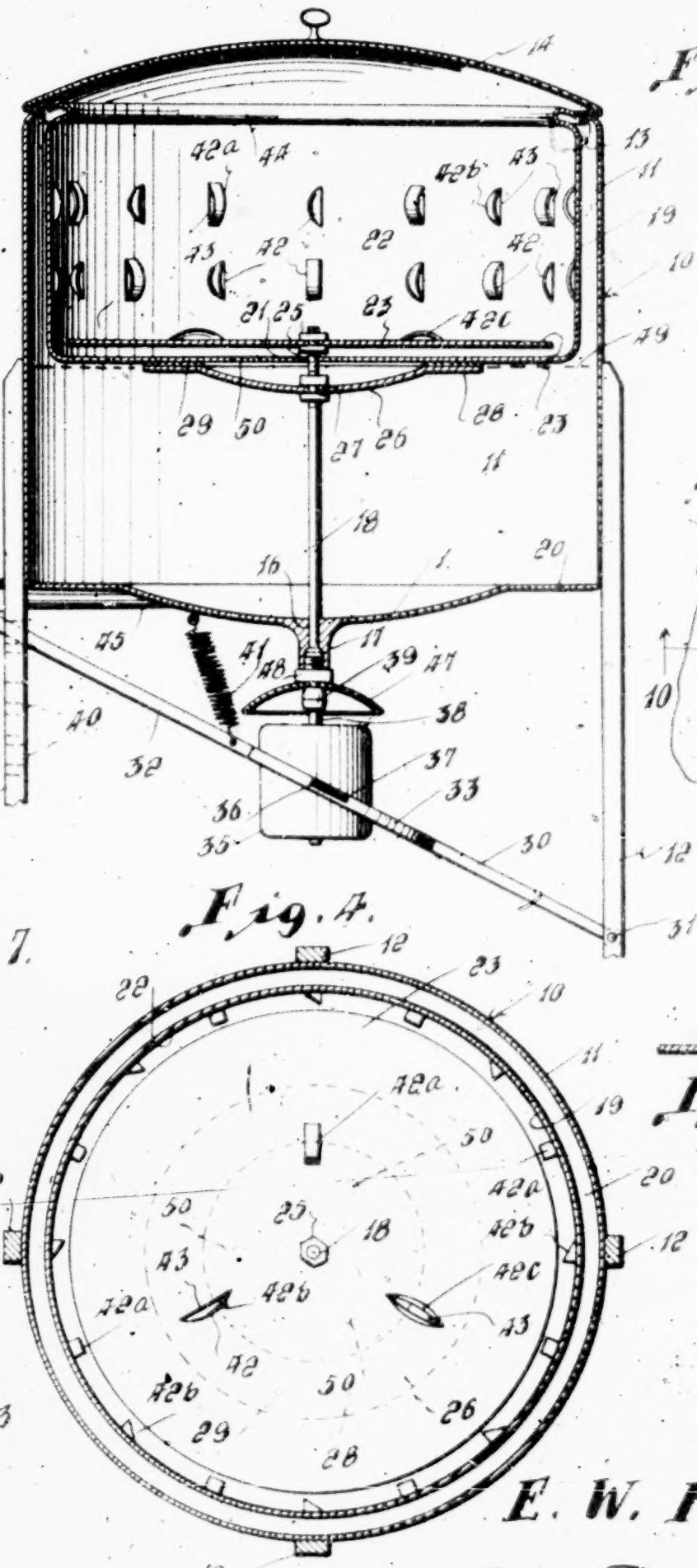

Fig. 5.

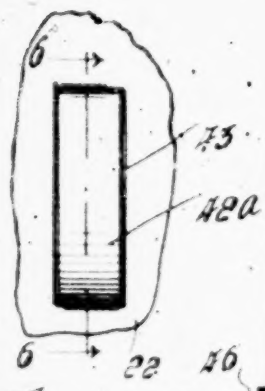

Fig. 6.

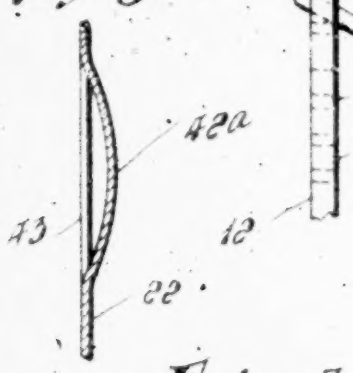

Fig. 9.

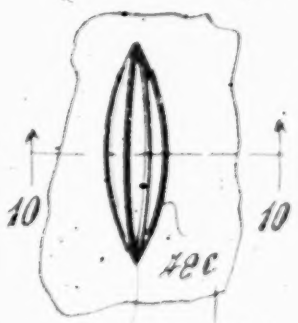

Fig. 10.

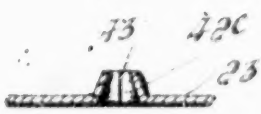

Fig. 7.

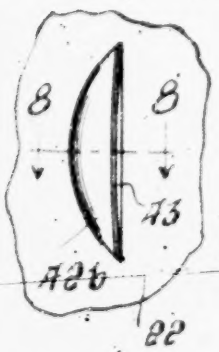

Fig. 8.

Fig. 4.

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Plaintiff's Exhibit 11(g)

Patented Nov. 25, 1941

2,264,202

UNITED STATES PATENT OFFICE

2,264,202

WASHING MACHINE

Elbridge W. Forney, Canton, Ohio

Application April 11, 1940, Serial No. 329,170

11 Claims. (Cl. 68—23)

This invention relates to an improved construction of washing machine of simple construction so constructed that it can be operated as a washer, sudser, wringer, water pump, rinser, water extractor, clothes separator, dryer and fluffer or wrinkle remover.

More particularly, it is an object of this invention to provide a washing machine of simple construction capable of being economically manufactured and sold having the movable parts thereof driven by a direct drive without the use of gears, belts or other connecting means.

Still another object of the invention is to provide a washing machine wherein the various operations will be performed by means of a revolving motion which produces a novel centrifugal action on the clothes and washing medium causing the clothes to roll and tumble as they are directed outwardly by the revolving and agitating parts so that the continually changing position of the clothes will cause the washing medium to thoroughly circulate through and reach all portions of the clothes, to produce a thorough washing or rinsing operation.

Still a further aim of the invention is to provide a washing machine including a single driven shaft journaled perpendicularly in the bottom of the casing thereof and connected to a motor disposed therebeneath and supported by elevating means whereby the shaft may be elevated so that the agitating disc, connected to the shaft, may be revolved alone or in conjunction with the clothes bowl, or these parts may be both elevated above the water level in the casing to permit the water to drain from the clothes without actually removing the water from the casing.

Other objects and advantages of the invention will hereinafter become apparent from the following description of the drawings, which illustrate a preferred embodiment thereof, and wherein:

Figure 1 is a vertical, substantially central sectional view of the machine,

Figure 2 is a horizontal sectional view taken substantially along the plane of the line 2—2 of Figure 1,

Figure 3 is a view similar to Figure 1 showing the moving parts of the machine in an elevated position,

Figure 4 is a horizontal sectional view taken substantially along the plane of the line 4—4 of Figure 1,

Figure 5 is an enlarged detail view in elevation of one form of agitating or propelling means,

Figure 6 is a longitudinal sectional view of the same taken substantially along the plane of the line 6—6 of Figure 5,

Figure 7 is a view similar to Figure 5 of another form of the agitating and propelling means,

Figure 8 is a transverse sectional view of the same taken substantially along the plane of the line 8—8 of Figure 7,

Figure 9 is a view similar to Figures 5 and 7 of still another form of agitating and propelling means, and

Figure 10 is a transverse sectional view taken substantially along the plane of the line 10—10 of Figure 9, and

Figure 11 is a vertical sectional view taken substantially along the plane of the line 11—11 of Figure 1.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the different views, 10 designates generally the improved washing machine including a cylindrical walled casing 11 which is supported in an elevated position by means of a plurality of legs 12, which depend therefrom, and which is provided with an open top 13 having a lid 14 for closing the same. The bottom of the casing 11 is provided with a concave central portion 15 having a central opening 16 surrounded by a bearing 17 which is secured to and depends from the underside of the portion 15.

A substantially perpendicular shaft 18 is journaled, intermediate of its ends, in the bearing 17 with one end thereof extending upwardly into the lower portion of the casing 11 and with its opposite end depending downwardly therefrom. A clothes bowl 19 is loosely mounted in the casing 11 with the outer portion of its bottom normally resting on the annular portion 20, of the bottom of the casing 11, which surrounds the concave portion 15, when the shaft 18 is in its normal lowered position, as seen in Figure 1. The bottom of the bowl 19 is provided with a central opening 21 in which a portion of the shaft 18 is loosely mounted and by means of which the cylindrical side wall 22 of the clothes bowl 19 is held in spaced apart relationship to the cylindrical side wall of the casing 11. A disc 23 is disposed in the bowl 19 and is provided with a central opening 24 to receive the upper threaded end of the shaft 18 to which it is keyed by means of the fastenings 25 which also retain the disc 23 in spaced apart, substantially parallel relationship to the bottom of the bowl 19. A clutch member 26 is disposed in the concave portion 15 and includes a central portion 27 which is keyed

to the shaft 18 and an outer, annular portion 28 which is disposed in spaced apart relationship to the bottom of the bowl 19 and therebeneath. A ring 29, of any suitable material for providing a frictional engagement with the bottom of the bowl 19, is mounted on the upper side of and suitably secured to the annular portion 28.

A lever 30 is disposed beneath the casing 11 and is pivotally connected at one of its ends by means of a pin 31 to one of the legs 12, adjacent the lower end thereof. As best seen in Figure 2, the lever 30 is composed of a pair of bars 32, the end portions of which are disposed in abutting relationship. The bars 32 are provided with intermediate portions 33 which are bowed outwardly relatively to each other to form an elongated open frame 34 in which is adapted to be mounted a motor 35 having diametrically opposed outwardly projecting studs 36 which are slidably and pivotally mounted in elongated slots 37 in corresponding portions of the outwardly bowed portions 33. The motor 35 is provided with a driven shaft 38 which is connected by means of a coupling 39 to the lower end of the shaft 18. The leg 12, opposite to the leg 12 on which the lever 30 is pivotally mounted, is provided with notches 40, as best seen in Figure 3, in which the free end of the lever 30 is adapted to be selectively positioned to adjustably position the motor 35. A contractile coil spring 41 is connected at one end to the bottom of the casing 11 and at its opposite end to the lever 30, adjacent its free end, to normally urge said end upwardly for counterbalancing the weight of the motor 35, the shaft 18, including the parts mounted thereon, and the contents of the clothes bowl 19.

The disc 23 and the side wall 22 of the bowl 19 are each provided with a plurality of struck-out portions which project upwardly from the disc 23 and inwardly of the wall 22 and which form the propelling and agitating fins 42. The fins 42 form openings 43 in the disc 23 and in the side wall 22. As best seen in Figures 5 to 10, the fins may be formed of a variety of shapes. In Figures 5 and 6, one form thereof, designated generally 42*a* is shown wherein both side edges of the fin are severed from the surface from which it is formed and to which it is connected at its ends, the intermediate portion thereof being bowed outwardly relatively to the surface. In Figures 7 and 8, another form of the fin, designated 42b is illustrated, and in this form the fin is crescent shaped and severed from the surface in which it is formed along a straight line to provide a fin having a single free edge rather than two, opposed free edges, such as the fin 42*a*. In Figures 9 and 10, a third form of fin designated 42*c* is illustrated. The fin 42*c* is formed by two opposed crescent shaped struck-up portions, the adjacent edges of which combine to form an elongated opening which tapers towards its end. Any one or all of these forms of fins 42 may be used to provide the propelling and agitating means of the wall 22 and the disc 23. In each of these forms, the edges are of sufficient thickness or are rounded to prevent clothes, not shown, contained in the bowl 19 from catching or snagging on the fins and being torn or otherwise damaged thereby. As best seen in Figures 1 and 3, the rim of the bowl 19 is turned outwardly and back upon itself and the beveled portion is bent inwardly to form an annular inwardly projecting flange 44. The concave bottom portion 15 is provided with a drain or filling passage 45 having a valve or pet cock 46. A convex shield 47 is mounted on the shaft 18 adjacent the coupling 39 to provide a cover for the motor 35 and to form a splash guard to protect the motor from any leakage from the casing 11. The bearing 17 is provided with a stuffing box 48 to prevent any leakage from the casing 11 around the shaft 18.

From the foregoing it will be obvious that the lid 14 can be removed for filling the bowl 19 with clothes to be washed and also for filling the casing 11 with water up to the level as indicated by the line 49. Water may also be supplied to the casing 11, if desired, by attaching a hose, not shown, to the passage 45. With the lever 30 in the position, as seen in Figure 1, the motor 35 will revolve the shaft 18 to turn the disc 23. The fins 42 will propel the clothes to cause them to roll and tumble in a circular motion and also outwardly of the disc 23 due to the centrifugal force produced thereby causing the clothes to strike the stationary wall 22 and be agitated by contact with its fins 42. Other clothes being directed outwardly by the disc 23 will tend to force the clothes already in contact with the wall 22 upwardly and into contact with the flange 44 which will direct the clothes inwardly and toward the axis of the bowl where their momentum will be lost causing them to drop back onto the disc 23, adjacent the center thereof, to repeat the operation. The fins 42 will also agitate the water within the bowl 19 so that the clothes will be further agitated by the water to be thoroughly cleansed thereby. The fins 42 of the wall 22 will also rub the clothes moving thereover to remove dirt therefrom in the same manner that clothes are scrubbed on the roughened surface of a washboard.

After the washing operation has been completed, the free end of the lever 30 is swung upwardly, from the position, as seen in figure, to the position, as seen in Figure 3, to raise the motor 35, the shaft 18, the disc 23 and the bowl 19. During this movement the motor 35 pivots and slides relatively to the frame 34 through the stud connection 36 and the slots 37 so that its shaft 38 remains in alinement with the shaft 18 and with the bearing 17. The bowl 19 in its raised position is above the water line 49 and the clutch 26 is in frictional engagement with the bottom thereof to cause the bowl to revolve with the disc 23 so that the water is extracted from the clothes by centrifugal action and drained from the bottom of the bowl 19 through the openings 50 to thereby extract the water and eliminate the need of wringing the clothes. The water may also be extracted by raising the shaft 18 just enough to lift the bowl 19 out of engagement with the surface 20 and to cause the clutch 26 to engage the bottom thereof and by opening the valve 46 to allow the water to drain from the casing 11 while at the same time revolving the bowl 19 to force the water therefrom, centrifugally through the openings 43 in the wall 22. In this operation the clutch 26 will function as a centrifugal pump for expelling the water from the concave bottom portion 15, which forms a drain and sediment trap so that by attaching a hose to the outlet end of the passage 45 the water may be pumped therefrom to a drain disposed at a higher point than the passage 45.

The clutch 26 may also be employed as a centrifugal pump when in the position, as seen in Figure 1, in which position the portion 15 and the bottom of the bowl 19 will form a chamber which is closed except for the openings 50 and from which the cleaning medium and sediment

may be expelled through passage 45 by revolving the clutch 26.

The machine 10 can also be used as a rinser by draining the casing 11, as heretofore described and refilling it with clean water, either through the top or through the passage 45 and continuing the agitation of the clothes in the same manner as in washing and extracting the water with the clutch 26 either in an engaged or disengaged position. It will be noted that in all of these uses it is not necessary to actually touch the clothes or the cleaning medium after the bowl 19 has once been filled.

After the clothes have been washed, rinsed and the water extracted therefrom and drained from the casing 11, the machine may be used as a dryer when the parts are in the position, as seen in Figure 1, in which position the disc 23 is revolved to agitate the clothes and to agitate the air within the casing 11, thereby loosening and separating the clothes to permit the air to pass therethrough to dry the clothes and to fluff the clothes and to remove wrinkles and creases therefrom. This same operation can be repeated with the shaft 18 and the other parts connected thereto in an elevated position, as seen in Figure 3, so that the fins 42 of the wall 22 will also function as agitators for the air and the clothes. The drying operation may be further enhanced by removing the lid 14 to permit a free circulation of air to and from the casing 11.

The agitating action of the various types of fins 42, during the washing operation, tends to create a vacuum and air pockets in the water and to otherwise agitate the water so that the soap or other cleaning detergent in the water will be agitated to produce the maximum of suds. The space between the wall 22 and the side wall of the casing 11 also tends to retain the heat of the water within the bowl 19.

Various modifications and changes in the construction and arrangement of the parts forming the machine are contemplated and may obviously be resorted to as only a preferred embodiment thereof has been disclosed.

I claim as my invention:

1. A washing machine comprising a casing, said casing being provided with supporting legs, a bowl for containing clothes mounted in said casing and provided with openings in the side wall thereof, a shaft journaled in the bottom of said casing and extending through the bottom of said bowl, an agitating member keyed to said shaft and disposed within the bowl, a clutch carried by said shaft and movable into engagement with the bowl, said clutch being disposed within the casing and beneath the bowl, supporting means mounted on said legs, and a motor pivotally and slidably mounted on said supporting means and provided with a driven shaft connected directly to said first mentioned shaft for turning said shaft.

2. A device as in claim 1, said supporting means being movably mounted relatively to the casing for raising and lowering the shaft for moving the clutch into and out of clutching engagement with the bowl.

3. A device as in claim 1, said supporting means being movably mounted relatively to the casing for raising and lowering the shaft for moving the clutch into and out of clutching engagement with the bowl, and for elevating the bowl relatively to the casing.

4. A washing machine comprising a casing having depending supporting legs, a clothes bowl mounted in said casing and is spaced apart relationship to the side wall thereof, a shaft journaled in the bottom of said casing and extending into said bowl, a disc keyed to the shaft and disposed within said bowl, said disc being provided with impelling and agitating means, a clutch fixed to said shaft and movable into clutching engagement with the bowl bottom by an upward movement of the shaft, a lever pivotally connected at one end to a supporting leg of the casing, and a motor slidably and pivotally supported by said lever and directly connected to said shaft for revolving the shaft, said lever being adjustable for raising and lowering the motor and shaft for moving the clutch into and out of engaging position.

5. A machine as in claim 4, the bottom of said casing being provided with a concave central portion forming a sediment and drain trap, a valve controlled outlet passage for said trap, and said clutch being normally disposed in the trap and rotatable, when in a released position, for centrifugally pumping the contents thereof through said outlet.

6. A washing machine comprising a cylindrical walled casing, a clothes bowl disposed therein, a shaft journaled in the bottom of the casing and disposed substantially perpendicular to the clothes bowl, a clutch keyed to the shaft and disposed within the casing and beneath the bottom of the clothes bowl, a lever pivotally mounted beneath the casing, and a motor slidably and pivotally supported by said lever and directly connected to the shaft for turning the shaft, said lever being adjustable to move the clutch into and out of engagement with the bowl and to raise the bowl to relatively to the casing.

7. A washing machine as in claim 6, the bottom of said casing having a central concave portion forming a sediment and drain trap, openings in the bottom of said bowl, above said trap, and a valve controlled drain passage for draining said trap, said clutch being normally disposed in said trap and rotatable therein to centrifugally expel the contents thereof through the drain passage.

8. A washing machine comprising a cylindrical walled casing, a bowl loosely mounted therein, a shaft journaled in the bottom of said casing and provided with clutch means for connecting it to said bowl, a motor disposed beneath the casing and directly connected to said shaft for revolving it, and means for raising and lowering the motor and shaft for raising and lowering the bowl relatively to the casing, said motor being slidably and pivotally connected to said means.

9. A machine as in claim 8, the upper end of said shaft extending through and being loosely disposed in the bottom of said bowl, a disc keyed to said end and disposed within the bowl, said disc being provided with propelling and agitating fins, and said motor supporting means being movable to a position for disengaging the clutch for revolving the disc relatively to the bowl.

10. A washing machine comprising a casing, the bottom of the casing having a central concave portion surrounded by a substantially flat annular portion, a clothes bowl disposed in the casing and provided with a substantially flat bottom, a portion of which normally rests on the flat portion of the casing bottom, a rotary, driven shaft extending through and journaled in the bottoms of the casing and bowl and slidably mounted therein, an agitator keyed to the shaft and disposed in the bowl, a clutch keyed to the shaft and normally disposed in the concave por-

tion of the casing bottom and beneath the bowl bottom, and means for raising the shaft to move the clutch into frictional engagement with the bowl bottom for rotating the bowl and for elevating the bowl relatively to the casing.

11. A washing machine comprising a casing having a bottom provided with a recessed portion, a clothes bowl loosely disposed in the casing and normally resting on the bottom thereof, a shaft journaled in the bottom of the casing and having one end extending through the bottom of the bowl, an agitator keyed to said shaft end and disposed in the bowl, a clutch keyed to the shaft and normally disposed in said recessed portion and beneath the bowl bottom, a motor directly connected to the opposite, lower end of the shaft, and means for slidably and pivotally supporting the motor and for raising and lowering the shaft and motor to move the clutch into and out of operative position and to raise and lower the bowl relatively to the casing.

ELBRIDGE W. FORNEY.

Aug. 12, 1930. L. B. GREEN 1,772,863

CENTRIFUGAL DRIER
Filed March 25, 1927 2 Sheets-Sheet 1

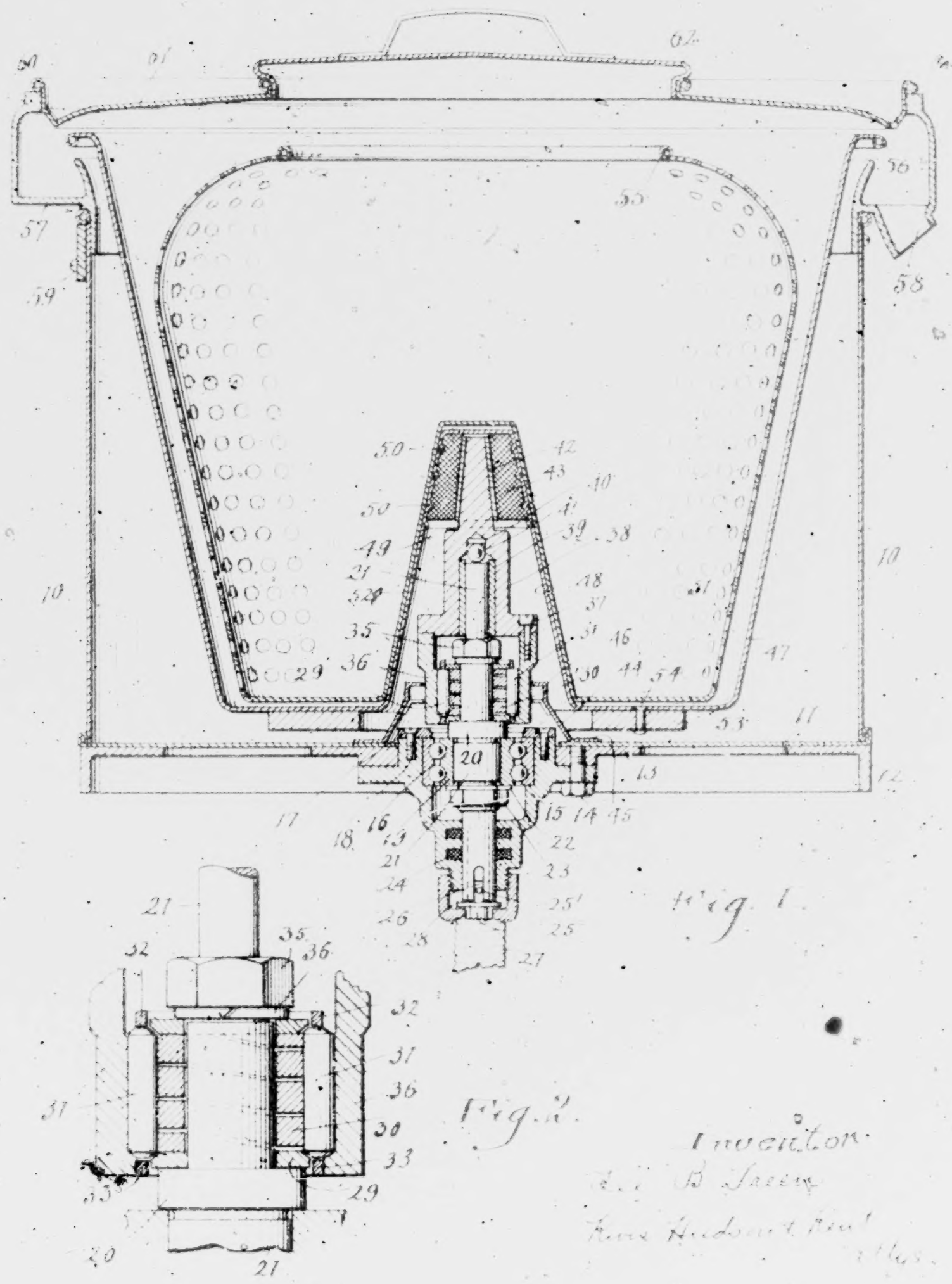

Fig. 1.

Fig. 2.

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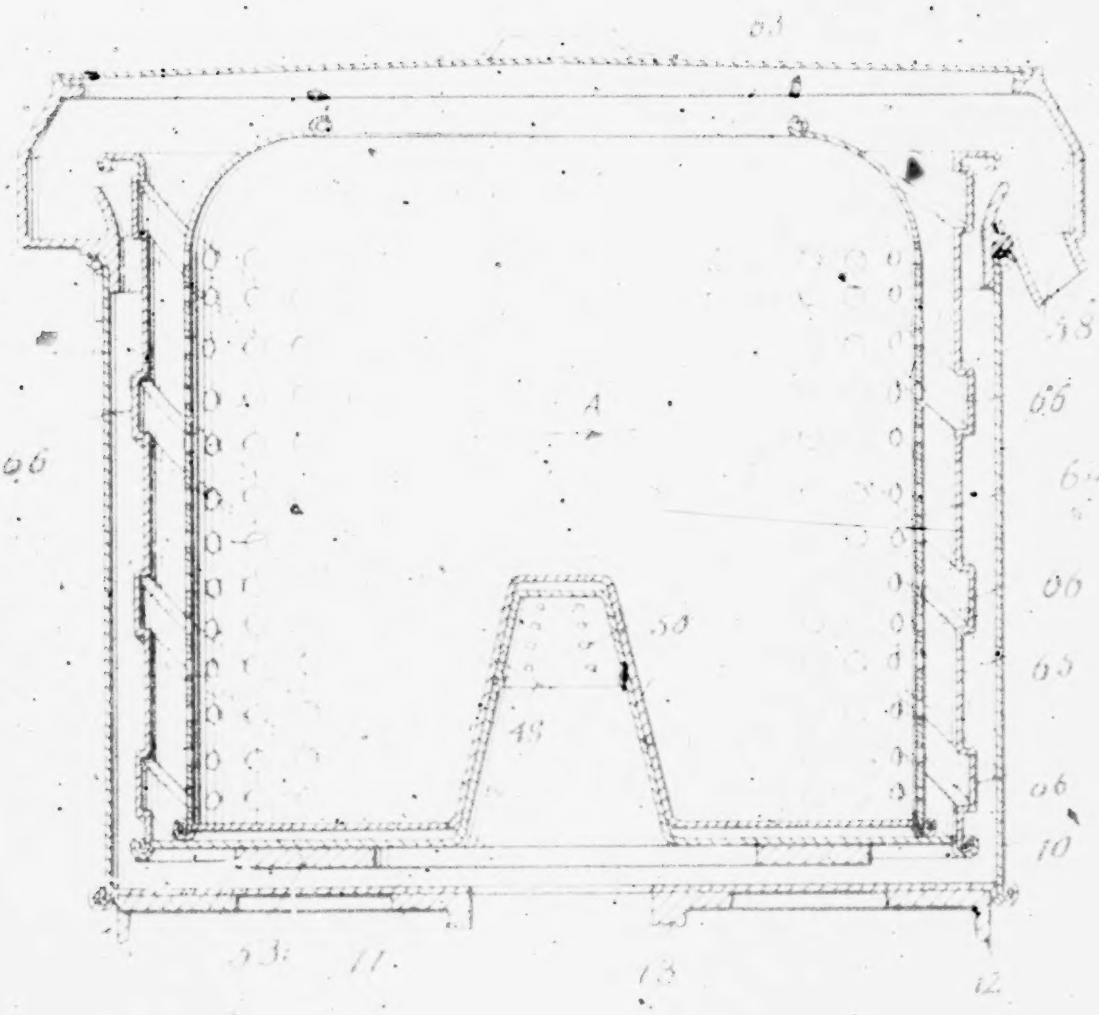

Fig. 3.

Fig. 4.

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Plaintiff's Exhibit 11(h).

499

Patented Aug. 12, 1930

1,772,863

UNITED STATES PATENT OFFICE

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CENTRIFUGAL DRIER

Application filed March 25, 1927. Serial No. 178,242.

This invention relates to improvements in centrifugal driers and has reference particularly to centrifugal driers for washing machines.

Driers for this purpose have been proposed in which the container is shaped like an inverted truncated cone having an imperforate wall, with the idea of causing water from the clothes to move upwardly and out over the upper edge of the container. A drier built in accordance with this idea is not all that could be desired inasmuch as the clothes themselves packed tightly against the walls by centrifugal force interfere considerably with the passage of water upwardly along the walls, and it results that at the end of an operation of the device, the clothes at the bottom of the container are not as well dried as those at the top.

One of the objects of the present invention is the provision of means for causing the discharge of the water removed from the clothes at the top of the rotating container while at the same time providing a passage or passages for the conduction of the water from the bottom of the container to the top thereof but which throughout its entire extent is beyond any direct contact with the clothes.

Another object is the provision of means for accomplishing the purpose stated consisting of a container having a double side wall, the inner element of which is perforated and the outer imperforate.

Another object is the provision of a container made up of two independent parts, namely, an inner clothes containing basket and an outer vessel formed to discharge water at the top thereof, the two parts being so formed that they are positively locked together for rotatable movement while they may be separated by merely lifting the basket out of the vessel.

Another object is the provision of a flexible driving connection for the container positioned centrally above the bottom thereof whereby the container is enabled to find its own balance and whereby vibrations set up in the rotating container due to uneven distribution of the load therein are absorbed or partially absorbed so that the vibration of the driving mechanism and of the machine as a whole is much reduced with obviously advantageous results.

Another object is the provision of what may be termed a flywheel at the bottom of the container thereby increasing considerably the total rotating mass with the result that uneven distribution of the load produces a correspondingly smaller proportionate unbalance than would be the case without such a flywheel, and thus reduces vibration.

Still another object is the provision of a friction clutch mechanism giving that slip in the driving mechanism during starting which is necessary to prevent overloading the driving motor, this clutch being entirely metallic and, therefore, withstanding wear admirably, but being readily adjustable to compensate for such wear as may occur.

Other objects, and objects relating to details of construction and economies of manufacture, will appear as I proceed with the description of those embodiments of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Fig. 1 is a vertical central sectional view of a centrifugal clothes drier embodying my invention;

Fig. 2 is a fragmental detail view showing the friction clutch mechanism of Fig. 1 on a larger scale;

Fig. 3 is a vertical central sectional view of a modified form of container for use in my invention; and

Fig. 4 is a fragmental view of a portion of an outer wall of still another modification of the container.

Referring particularly to Figs. 1 and 2, the casing of the machine, which may be generally cylindrical, has a side wall 10 of sheet metal with a bottom 11 of the same material provided with a central opening. The bottom of the casing has suitable reinforcements including a peripheral element 12 and a ring 13 surrounding the opening in the bottom of the casing. The ring 13 has secured thereto by a plurality of machine screws 14 a bearing-supporting casting 15. The casting 15 is internally shouldered to support the

outer race 16 of a radial and thrust ball bearing, the outer race being held to the shoulder by a ring 17 which is secured to the casting by screws 18. The inner race 19 of this bearing abuts against an enlargement 20 on a shaft 21, being held in position by a washer and nut 22 and 23, respectively, the nut being threaded on the shaft 21. Packing rings 24 are mounted in the lower part of the casting 15 to prevent the escape of lubricating oil. The shaft 21 extends downwardly out of the casting 15 and at its lower end has provision for connection with some driving means which in the drawings takes the form of a flexible shaft 25 having a driving pin 25' working in a slot 26 in the shaft 21.

The flexible shaft is preferably enclosed in a flexible armor 27 attached to a fitting 28 threaded onto the lower extremity of the casting 15.

Next above the enlargement 20 of the shaft 21 is a washer 29 which supports the lower end of a spiral spring 30 formed of wire of square cross-section which is ground to an accurate measurement on its outer surface and constitutes the inner race of a roller clutch, two of the rollers of which are shown at 31. The rollers 31 are mounted in a cage, the upper and lower portions of which are shown at 32 and 33, respectively. Above the spring 30 is a second washer 34 which may be caused to compress the spring 30 more or less, a nut 35 with a lock washer 36 being employed for this purpose, the nut 35 being threaded upon the reduced upper end of the shaft 21. By increasing the compression of the spring 30, its diameter may be increased whereby the friction in the roller clutch is varied and controlled.

The outer race 36 of the roller clutch is extended upwardly to form an enclosure for the nut 35, and its upper end has attached thereto by screws 37, or the like, a casting 38 which is centrally bored to receive a bushing 39 fitting the shaft 1 and counterbored to receive a steel bearing disk 40 and a steel ball 41, these latter parts transmitting end thrust to the shaft 21, the rollers 31 taking radial thrust only. The upper end of the casting 38 is tapered slightly to receive with a tight sliding fit a tapered sleeve 42 upon which is mounted an annular block 43 of soft rubber.

An annular sheet metal element 44 has a flange 45 at the bottom thereof which is welded or otherwise secured to the bottom 11 of the machine casing. At its upper end, the element 44 carries a packing ring 46. Thus the rotating parts are enclosed and the discharge of lubricating oil is prevented.

In carrying out my invention, I preferably form the clothes container of two parts, one of which is an outer vessel 47 having a central upstanding and preferably conoidal portion 48 having a bead 49 in its wall adapted to abut against the lower end of the block 43 and having a series of small rounded projections 50 that take into the rubber of the block 43 so that a good driving connection results. The closed upper end of the upstanding portion 48 may rest upon the upper end of the block 43. The other part of the container is a perforate basket 51 also preferably provided with a central upstanding portion 52 of conoidal form which rests upon the upstanding portion 48 of the outer vessel and has a frictional engagement therewith so that rotation imparted to the outer vessel 47 is transmitted to the basket 51.

The bottom of the container carries a mass evenly distributed in a circle around the axis of the container. In practice, I prefer to use for this mass a ring 53 and to secure it to the lower surface of the vessel 47 by means of rivets 54 or the like. This ring 53 which is in the nature of a flywheel may vary as to weight but I prefer that it shall have a mass at least equivalent to the weight of the wet clothes which the container is intended to receive.

The upper portion of the basket 51 is curved inwardly and may be rolled into a rim 55 surrounding the hand opening into the basket. The side wall of the vessel 47 inclines outwardly toward the top and at its upper edge is flanged and rolled into a rim 56.

Around the top of the wall 10 of the machine casing is a trough 57 formed preferably in a casting of aluminum or aluminum alloy, the trough having a slight downward inclination on both sides towards the water exit 58. The casting in which the trough 57 is incorporated may be secured to the top of the wall 10 by any suitable means. A reinforcing bar 59 may extend partially or entirely around the casing and preferably supports part of the weight of the machine. Above the trough 57 and integral therewith is a ring 60 into which fits snugly the cover 61 which has a large central opening for the reception of a smaller cover 62. During the operation of the machine, it is necessary only to use the cover 62, but the removal of the outer cover 61 is, of course, necessary before the basket 51 can be lifted out of the machine.

Referring now to Fig. 3, the casing of the machine is substantially the same as in the form above described except that in this figure, I have shown a single large cover 63 although obviously the double cover of Fig. 1 may be substituted, if desired. The driving mechanism is not illustrated but the same mechanism as is shown in Fig. 1 may be employed. The container as in the form first described is made in two parts, but in this modification the side walls 64 and 65 of the inner basket and the outer vessel, respectively, are both vertical. The wall 65 has formed therein a series of spiral grooves or

passages 66 extending from the bottom of the wall to the top thereof.

Fig. 4 illustrates the side wall construction of a different modificaton of the container in which 67 is the side wall of the outer vessel and is vertical, but instead of being grooved as is the wall 65 of Fig. 3, its spiral passages are formed of Z-shaped bars 68 spirally arranged upon the inner surface of the wall 67 and secured thereto by rivets, spot welds or in any other suitable manner.

The operation of the machine will be more or less obvious from the above description of its construction. Water thrown from the clothes by centrifugal force during rapid rotation of the container will pass through the perforations in the side walls in the basket 51 or 64 as the case may be, and will be discharged onto the side walls 47, 65 or 67 of the outer vessel. In the case of the construction shown in Fig. 1, water deposited on the wall 47 is caused by centrifugal force to flow upwardly and out over the upper edge of the wall and to the trough 57 whence it finds its way out through the exit opening 58 and into some suitable receptacle not shown. In the case of the construction shown in Fig. 3, water deposited on the vertical wall 65 finds its way into the grooves 66. Then the rotation of the container in the direction indicated by arrow A raises the water by a screw action, combined with centrifugal force, until it flows out over the top of the wall 65 and into the trough 57. Exactly the same operation follows in the case of the construction shown in Fig. 4. In all three forms of the invention herein illustrated, it is obvious that the water is removed from the clothes to an equal extent regardless of their distance from the top or bottom of the container and that the removed water finds its way to the top of the outer vessel without having any further contact with the clothes.

During the rotation of the container, the rubber block 43 serves to absorb or partially absorb vibrations which are set up on account of any uneven distribution of the wet clothes in the inner basket.

Having thus described my invention, what I claim is:

1. In a centrifugal drier, a container, supporting and driving means therefor attached thereto at a central point above the bottom of the container, said supporting and driving means comprising a block of resilient material for the absorption of vibrations due to uneven distribution of the load in said container, and a heavy mass evenly distributed in a circle below the container and secured thereto for movement therewith, whereby the amount of vibration due to unevenness of the load is reduced.

2. In a centrifugal drier, a driving means comprising a vertical shaft, a rubber block at the upper end thereof, an upstanding conoidal rotating element mounted on said block, and a basket provided with a conoidal projection extending upwardly from the bottom thereof adapted to fit snugly upon the said conoidal rotating element and to be supported thereby, whereby a frictional driving connection and a vibration reducing support for the basket are obtained and whereby the basket may be removed by simply lifting it off the rotating element.

3. In a centrifugal drier, a driving means comprising an upstanding rotating element, an imperforate vessel having a central upstanding portion enclosing and locked to said rotating element, and a perforate basket adapted to set within said vessel and provided with a central upstanding portion adapted to enclose the upstanding portion of said vessel, said upstanding portions being so formed and constructed that they are locked against relative rotational movement by downward vertical movement of the basket only and unlocked by a vertical movement of the basket upwardly.

In testimony whereof, I hereunto affix my signature.

LEE B. GREEN.

July 23, 1935. J. B. KIRBY 2,009,111

LAUNDRY MACHINE

Filed Nov. 14, 1930

Fig. 1

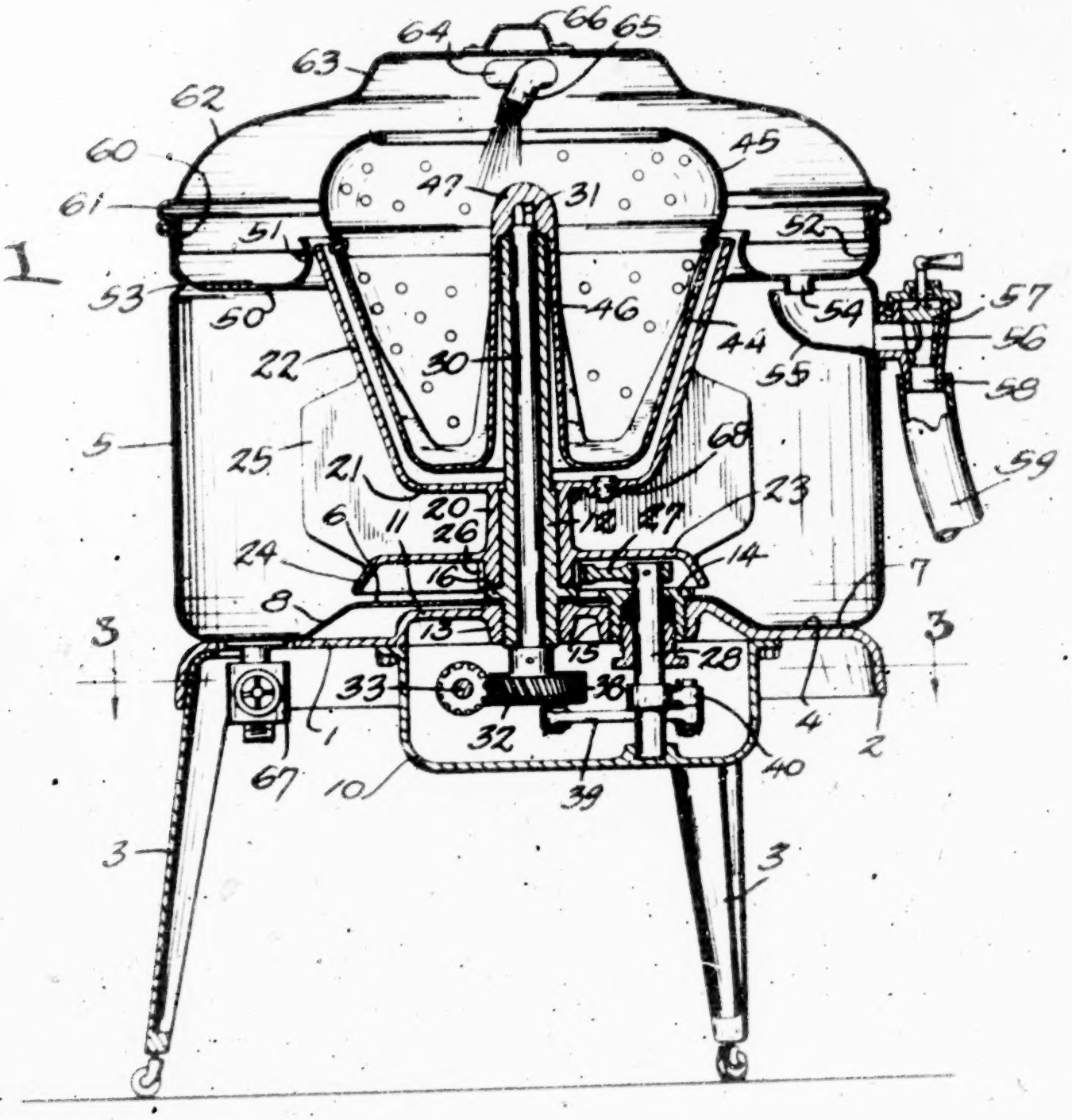


Fig. 2

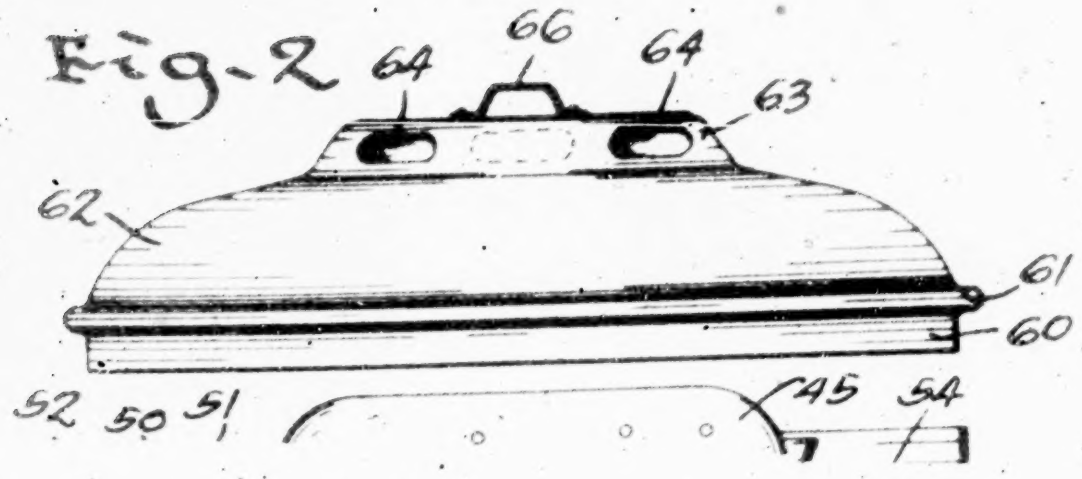
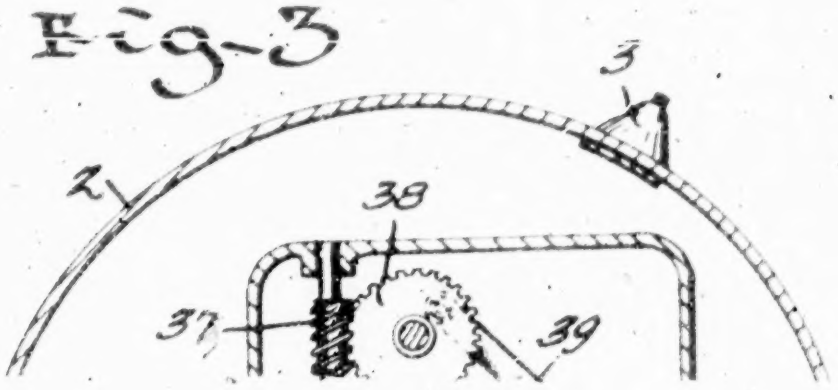


Fig. 3



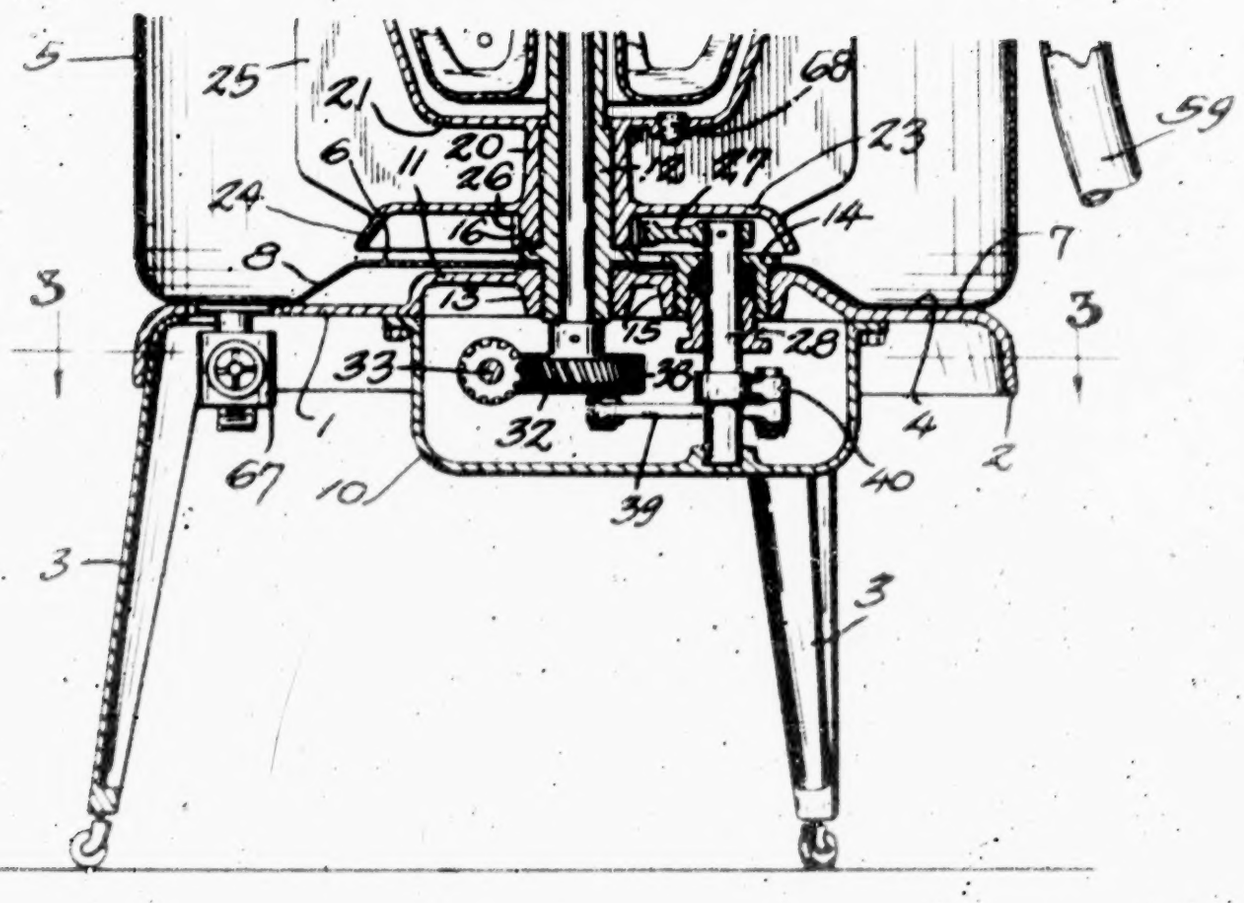


Fig-2

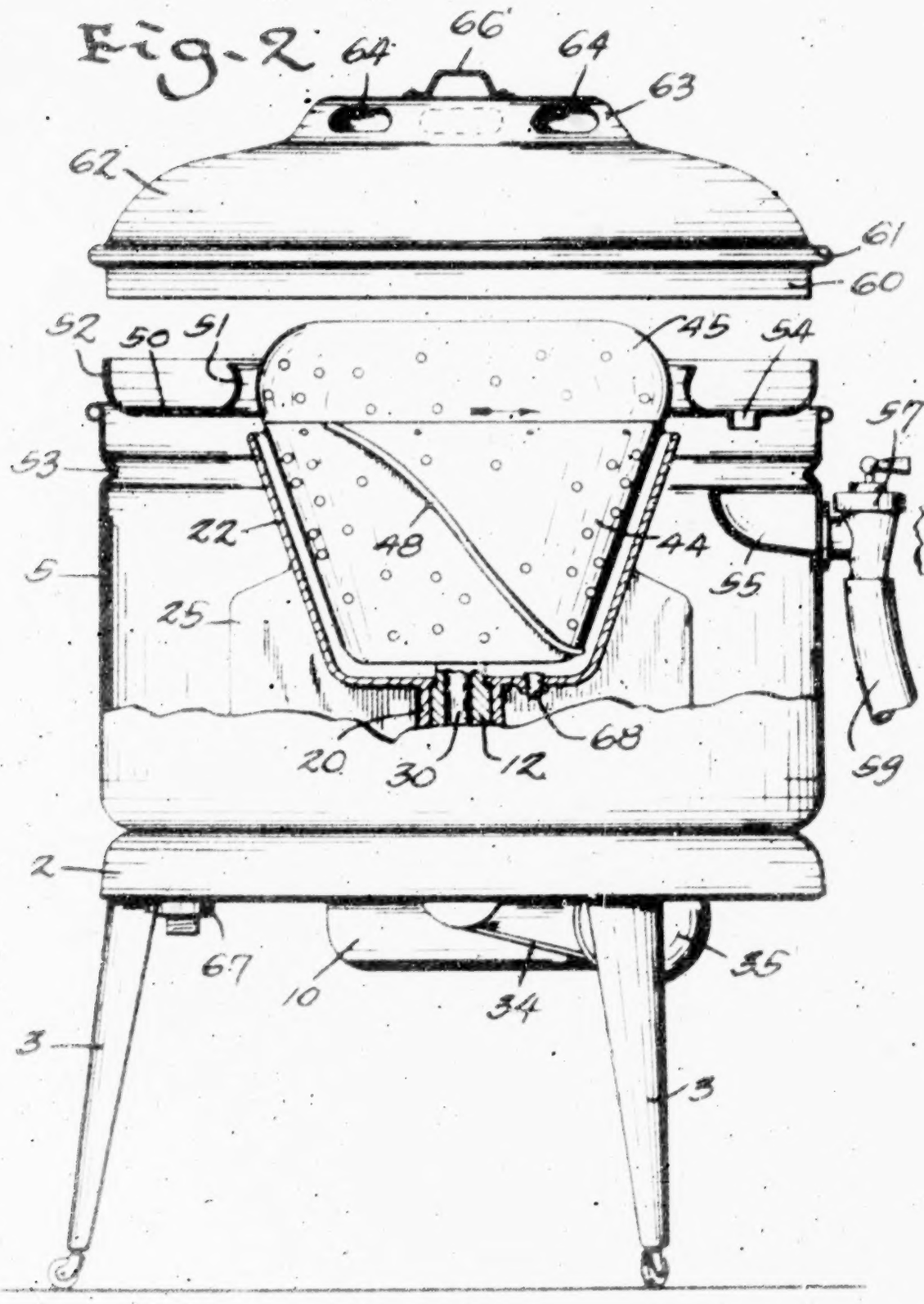
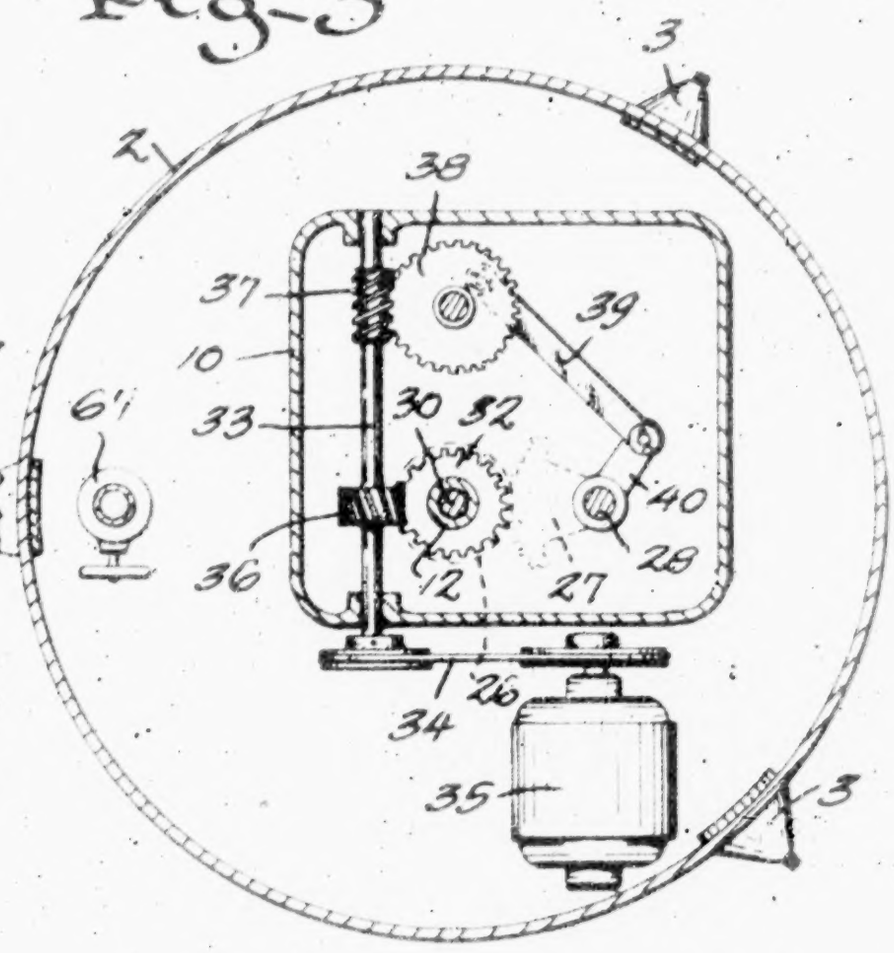


Fig-3



James B. Kirby
INVENTOR
By Smith and Freeman
ATTORNEYS

Plaintiff's Exhibit 11(i)
503

Patented July 23, 1935

2,009,111

UNITED STATES PATENT OFFICE

2,009,111

LAUNDRY MACHINE

James B. Kirby, West Richfield, Ohio, assignor, by mesne assignments, to The Apex Electrical Manufacturing Company, Cleveland, Ohio, a corporation of Ohio, as trustee

Application November 14, 1930, Serial No. 495,685

27 Claims. (Cl. 68—15)

This invention relates to laundry machines and has for its object the provision of an especially simple and inexpensive device for washing miscellaneous articles of clothing as encountered in domestic practice, and extracting the liquid centrifugally. Subsidiary features of the invention relate to the selective disposal of the extracted liquid, the provision of means for rinsing the extracted articles; the construction and mode of combining and operating the different elements, while further objects and advantages of the invention will become apparent as the description proceeds.

A specimen embodiment of my inventive idea is shown in the accompanying drawing which will be understood as merely illustrations of the principles of my invention without any idea of limitation to the features there shown.

Fig. 1 is a vertical, sectional view through the complete machine, with its parts in operative position; Fig. 2 is a view partly in elevation and partly in section showing certain of the parts separated, and Fig. 3 is a horizontal sectional view corresponding to the line 3—3 of Fig. 1.

My improved machine preferably comprises a supporting frame including a circular metal plate 1 having a down-turned peripheral flange 2 and legs 3, the top of said plate having a flat supporting-portion 4 for the liquid-containing casing. This casing is made of metal, preferably enameled, having an upright side-wall 5 formed as a surface of revolution, and having a bottom formed in two levels, namely an elevated central portion 6 and an annular surrounding portion 7, the two connected by a slant-walled portion 8, the annular portion 7 resting on the supporting-portion 4 of the plate 1.

Fastened to the bottom face of the plate 1 is a box-like member 10 constituting a gear-housing and in the present embodiment the top of the plate 1 is elevated as shown at 11 inside the region 7 of the tub or casing so as to contact with the elevated portion 6 of the latter. Each of the portions 6 and 11 is formed with two registering apertures, one of the same being coaxial with the tub-wall and receiving the upstanding hollow bearing-sleeve 12, whose lower end is threaded into a socket 13 in the portion 11, the other receiving a hollow packing-gland 14 similarly threaded into a boss 15 in the portion 11. A flange 16 on the sleeve 12 serves to hold down the tub, and also to constitute a bearing for the element which is mounted thereon.

Surrounding the sleeve 12 is a combined dasher or agitator and extractor-shell. This comprises a hollow sleeve 20 loosely surrounding the lower end of the sleeve 12 and provided at its upper end with a hollow receptacle having a circular bottom 21 which merges with upwardly and outwardly-flaring sides 22, also defining a surface of revolution.

Projecting laterally from the sleeve 20 at a point below the bottom 21 is a circular plate 23 terminating at its margin in a depending flange 24 near the slanted position 8 of the tub bottom; and connecting the container 22 and plate 23 are radial blades or vanes 25.

Below the plate 23 the sleeve 20 is formed with spur-teeth 26 which mesh with the teeth of a segment gear 27 located in the space between plate 23 and tub-portion 6, being carried by the upper end of a rock-shaft 28 which is journaled in the packing gland 14. Rotatably journaled inside the sleeve 12 is an upright shaft 30 whose upper end projects above the top of the sleeve 12 and is made prismatic as shown at 31 for a purpose hereafter described, while its lower end is provided with a spiral gear 32 located inside the gear-housing heretofore mentioned. Journaled in this gear-housing is a horizontal drive-shaft 33 suitably driven in any suitable way as by the belt 34 and motor 35. Carried by this shaft inside the housing are two spiral gears of unequal mechanical advantage, one shown at 36 meshing with the gear 32 and the other shown at 37 meshing with a companion gear 38 located inside the gear-box and operatively connected to the shaft 28 by means of a pitman 39 and lever 40. For simplicity I have shown no clutch or other disengaging element, the shaft 30 being here rotated at all times that the mechanism is in operation, though it will be understood that clutches or other controlling means can be employed.

Located inside the flaring shell 22 is a foraminous centrifuge-container comprising essentially an upwardly-flaring frusto-conical wall 44 parallel with and closely adjacent to the shell 22 and rising above the same in the form of an externally convex, perforated rim 45. The sleeve 12 rises a sufficient height into the shell 22 to avoid danger of leakage of liquid into the gear casing, and the bottom of the container is formed with an upstanding, hollow hub 46 loosely surrounding said sleeve and terminating at its upper end in a socket-portion 47 formed to receive snugly the prismatic end 31 of the shaft. The exterior of the wall 44 is preferably formed with one or more projecting ribs 48, preferably spiral or helicoid in development, and slanted in such wise

as to assist the rotational effect of the container in elevating the extracted liquid up the slanting side wall of the shell 22 until it is ejected over the upper edge thereof. The rim-portion 45 is located above the edge of the shell 22 and serves to prevent the ejection of clothing articles centrifugally from the container. The top edge of the dasher is located above the normal liquid level in the casing 5 which ordinarily is at some distance below the tub corrugation 53. By reason of this arrangement the water in the tub 5 does not get into the cavity formed in the dasher.

In case it be desired to segregate the extracted liquid from the detergent liquid in the tub 5, a receiver of annular form is provided, comprising a bottom 50, an inner wall 51, and an outer wall 52 fitting inside the side wall 5 and supported in any suitable manner as by an in-turned corrugation 53. The top of the wall 51 is approximately on a level with the top of the shell 22 while the bottom 50 is formed with a discharge-spout 54 adapted either to register with a catch-basin 55 carried by the tub-wall or to discharge back into the tub. The basin 55 communicates laterally with the inlet port 56 of a discharge valve 57 whose outlet 58 is connected to a hose 59.

Fitted to the top of the wall 5 is a removable cover, preferably having a depending flange 60 to fit inside the wall 52, a circumferential flange 61 to rest on top of the wall 5, a domed portion 62 surrounding the rim 43, and a central boss or cupola 63 above the open top of the container. The side wall of this cupola is formed with a plurality of slots or apertures 64, preferably at least three in number, so that one of the same can serve for the accommodation of a hose 65 for rinsing liquid, a second for an inspection window, and the remainder for the admission of light to the interior. It is practically impossible with upwardly flared extractor to rinse while running open, due to the tendency of the water to fly over the edge of the extractor, but this arrangement shields the operator while permitting a sufficient view of the operation. The cover is also provided with one or more hand-grips 66 for its manipulation, and the bottom of the tub with a waste-valve 67 for its evacuation; the bottom of the shell 22 is preferably formed with a drainage aperture closed in any suitable manner as by a cork-stopper 68 in order to facilitate the cleansing and drying of the apparatus.

The sleeve 20 and gear-teeth 26 are preferably formed of die-cast metal, since most of these compositions are substantially non-corrodible, have good anti-friction qualities, and are successfully lubricated by soapy water. The depending flange 24 protects this gearing from the admission of clothing which might otherwise clog the same and become injured. The comparatively slow speed of the shaft 28 enables the employment of a tight packing without undue waste of power, while the complete separation of the shaft 36 from the oscillating mechanism, by being located inside the sleeve 12, while the oscillating mechanism is located wholly outside that sleeve, enables the high-speed shaft to be journaled for low friction without entailing risk of liquid leakage.

Furthermore it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth are presented for purposes of explanation and that various modifications of said apparatus and procedure can be made without departure from this invention as described in the appended claims.

Having thus described my invention what I claim is:

1. A laundry machine having two compartments, one inside the other, the inner compartment comprising an extractor chamber and the outer compartment adapted for the reception of a detergent fluid, walls for forming said compartments, an extractor-container inside said first compartment and means for mechanically agitating the fluid in said second compartment, said container extending above the top of said inner compartment and said agitating means being integral with the wall forming said inner compartment.

2. A laundry machine having two compartments, one surrounding the other and having a common wall between them, clothes-washing elements in the outer compartment and rigid with said wall, an extractor-container in the inner compartment, and mechanical devices for moving said wall and thereby operating said clothes-washing elements and for rotating said container.

3. A laundry machine having two compartments, one inside the other and separated by an upwardly-flaring common wall which defines a surface of revolution about a vertical axis, clothes-washing elements in the outer compartment and rigid with said wall, an extractor-container in the inner compartment and projecting above said wall, mechanical devices for moving said wall and thereby operating said clothes-washing elements and for rotating said container, and a removable liquid-discharge element closing the gap between the top of said wall and the outer wall of said washing compartment.

4. A laundry machine having two compartments, one inside the other, and separated by a single wall-element, clothes-washing elements carried by the exterior of said wall-element, mechanical means for moving said wall-element to agitate clothing and liquid contained in the outer compartment, and a centrifuge-container in the inner compartment separated from the contents of the outer compartment by said wall-element.

5. A laundry machine comprising an outer tub, a separate shell supported in said tub and defining two separate and distinct compartments, one inside the other, the outer compartment adapted for the reception of a detergent fluid, mechanism for imparting movement to said shell, agitating members carried by the exterior of said shell, an extractor container inside the inner compartment, and mechanism for rotating said container.

6. A laundry machine comprising a liquid holding casing having a bearing carried by its bottom, and a hollow dasher and an extractor located inside said casing, said extractor being inside said dasher, members on the exterior of said dasher for agitating the liquid contents of said casing, and means working through the bottom of said casing for driving both said dasher and extractor.

7. In a laundry machine, a casing for clothes and liquid, an extractor-container inside said casing, a hollow shell around said container, said shell being oscillatable, dasher-vanes in said casing movable with said shell for agitating the clothes and liquid in said casing, and means for rotating said container and oscillating said shell.

8. A laundry machine having simultaneously usable washing and extracting devices concentrically arranged, with the latter inside the

former, and means for simultaneously imparting different types of motion to said devices, said extracting device comprising a flared walled container whereby the extracted liquid is caused to ascend and be discharged outside of the washing device.

9. In a laundry machine, a casing for clothes and liquid, means for establishing a liquid-level therein, an extractor of upwardly-flaring shape inside said casing and having its top above such level, means for ejecting extracted liquid from the top of said extractor, a movable gutter surrounding said extractor and having a drainage opening, discharge-connections communicating with said first named means for conveying extracted liquid from the drainage opening to a place outside the limits of said casing, and means for mechanically agitating the liquid in said casing.

10. In a laundry machine, a casing for clothes and liquid, a dasher rising from the casing bottom and having blades for agitating the clothes and liquid, the upper part of said dasher being hollowed out, a centrifuge container rotatably mounted in the hollowed out portion of said dasher, and means for rotating said container and oscillating said dasher said container having an upwardly flaring side wall whereby the extracted liquid is elevated to a place of discharge.

11. In a laundry machine, a casing for clothes and liquid, a hollow dasher inside said casing, an extractor inside said dasher and extending above the top of the casing, means for rotating the extractor and oscillating the dasher, and a movable liquid receiver located on a level to receive liquid discharged from said extractor and having a discharge opening adapted in one position to divert extracted liquid into a passageway leading to the outside of said casing.

12. In a laundry machine, a casing for clothes and liquid, an extractor-container in said casing, a hollow agitator surrounding said container and having provisions for agitating the clothes and liquid in said casing, and means for oscillating said agitator and rotating said container.

13. In a laundry machine, a liquid holding casing, a dasher in said casing having a hollow portion, external liquid-agitating blades on said dasher, said dasher constituting the shell of a centrifugal extractor, and a rotatable container inside said shell.

14. In a laundry machine, a casing for clothes and liquid, an agitator journaled on an upright axis inside said casing, said agitator having a portion extending near the bottom of said casing and also having upright liquid-agitating blades, and also having a hollow axial portion formed with an upwardly-flaring wall defining a surface of revolution about said axis, a centrifuge-container located in the cavity of said agitator and also having upwardly-flaring walls, means for oscillating said agitator about its axis, and means for rotating said container.

15. A laundry machine comprising a tub, operating-mechanism including a vertical shaft projecting through the bottom of said tub, a centrifuge-container carried by said shaft, and upwardly-flaring shell formed as a surface of revolution about the shaft axis, said shell surrounding said container and spaced from the tub-wall and defining therewith a washing-compartment, said container fitting closely in said shell, agitating members in said washing-compartment connected to the shell, means working through the bottom of said tub for operating said agitating-members, and mechanism for rotating said shaft and operating said means, said container having an external rib sweeping closely past the wall of said shell as said container is revolved.

16. A laundry machine comprising a tub, operating-mechanism including a vertical shaft projecting through the bottom of said tub, a centrifuge-container carried by said shaft and formed as an outwardly-flaring surface of revolution about the shaft-axis, an oscillatable shell surrounding said container and spaced from the tub-wall and defining therewith a washing-compartment, said shell having its wall substantially parallel to that of the container, agitating members carried by the exterior of said shell, means oscillatably supporting said shell, means working through the bottom of said tub independent of said shaft for oscillating said shell, and mechanism for rotating said shaft and operating said last-named means.

17. In a laundry machine, a tub, two vertical shafts independently journaled in the bottom of said tub on different axes, an extractor container secured to one of said shafts inside the tub, a clothes-washing element having a cavity for reception of said extractor container and operatively secured to the other shaft inside said tub with said extractor shaft traversing said washing element, and mechanism beneath said tub for rotating the first shaft and operating the second shaft.

18. In a laundry machine, a liquid holding tub, two vertical shafts independently journaled in the bottom of said tub on different axes, an extractor container secured to one of said shafts inside the tub, and a clothes-washing-element having a cavity for reception of said container and operatively secured to the other shaft inside said tub and surrounding the first shaft.

19. In a laundry machine in combination a tub, a hollow upright bearing-sleeve traversing the tub-bottom and rising a substantial distance therein, an oscillatable agitator surrounding said sleeve, an upright shaft journaled inside said sleeve, an extractor-container secured to the upper end of said shaft and located in a cavity formed in said agitator, a second shaft journaled in the bottom of said tub at one side of said sleeve, operative-connections inside said tub between said second shaft and said agitator, and mechanism beneath said tub for operating both of said shafts.

20. In a laundry machine in combination a tub, an upright bearing-element carried by the tub-bottom, a shaft extending through said element, an extractor container operatively connected to the upper end of said shaft, an oscillatable dasher journaled on the exterior of said bearing element, said dasher having clothes-agitating elements and also having at its lower end a circular plate overlying the tub-bottom, an upright shaft journaled in said tub-bottom at one side of said element and beneath said plate, operative connections between said shaft and dasher external to said bearing element, and mechanism beneath said tub for operating said shafts.

21. In a laundry machine in combination a tub, an oscillatable dasher journaled therein upon a vertical axis and having both agitating elements and gear-teeth formed thereon, a shaft journaled in the tub-bottom at one side of said axis, a

segment-gear carried by said shaft and engaging said gear-teeth, a protecting element interposed between said agitating elements and said gear, a vertical shaft extending through said dasher, an extractor container operatively connected to the upper end of said shaft, and mechanism beneath said tub for oscillating said first named shaft and rotating said last named shaft.

22. In a laundry machine in combination a casing, a centrifugal extractor located inside said casing and having upwardly-flaring walls terminating approximately level with the top of the casing-walls, and spaced from said casing-walls to define a working-opening, washing elements inside said casing in the space beneath and surrounding said extractor, mechanism for simultaneously operating said washing-elements and rotating said extractor, said extractor being so constructed that such rotation serves to eject its liquid-contents over the top of said flaring walls, an annular gutter removably-seated in the space between said casing-wall and flaring-walls and adapted to receive the extractor-liquid, discharge connections from said gutter to the exterior of the casing, and a removable cover for said casing and gutter embracing the upper end of said extractor.

23. In a combined clothes washing and extracting machine, an upright casing, means for mechanically agitating the liquid in said casing, a container for clothes and liquid rotatably mounted in said casing on a vertical axis, said container having side walls which define a surface of revolution about said axis and flare upwardly from the bottom to a level which is above the top of said casing, the bottom of said container being below the normal liquid level in said casing, said agitating means comprising walls forming an open chamber in said casing for the reception of said container, and a removable cover for said casing, said cover having a part adapted to surround the projecting portion of said container, and said container having liquid discharge apertures in said projecting portion.

24. In a combined clothes washing and extracting machine, an upright casing, means for mechanically agitating the liquid in said casing, a container for clothes and liquid rotatably mounted in said casing on a vertical axis, said container having side walls which define a surface of revolution about said axis and flare upwardly from the bottom to a level of maximum diameter and there formed with liquid discharge apertures, the bottom of said container being below the normal liquid level in said casing, said agitating means comprising walls forming an open chamber in said casing for the reception of said container, and an annular gutter removably attached to said casing with its inner wall lower than said apertures.

25. In a combined clothes washing and extracting machine, a container for clothes and liquid rotatably mounted on a vertical axis, and having side walls which define a surface of revolution about said axis and flare upwardly from the bottom to a level of maximum diameter and there formed with liquid discharge apertures, an upright casing surrounding said container and having an annular gutter surrounding said container below said liquid discharge apertures, the bottom of said container being below the normal liquid level in said casing and shielded from contact therewith, a cover for said casing removably mounted above said gutter and having a side wall depending at least as low as said container apertures, a washing compartment in said casing below said gutter, and means enclosing the lower part of said container for mechanically agitating the liquid in said casing.

26. In a combined clothes washing and extracting machine, an upright casing, means for mechanically agitating the liquid in said casing, a container for clothes and liquid rotatably mounted in said casing on a vertical axis, said container having side walls which define a surface of revolution about said axis and flare upwardly from the bottom to a level of maximum diameter and there formed with liquid discharge apertures, the bottom of said container being below the normal liquid level in said casing, said agitating means comprising walls forming an open chamber in said casing for the reception of said container, and an annular element removably carried by said casing and surrounding said chamber and container below said container apertures, said element having internal and external walls connected by a bottom wall and defining a gutter, and a controlled outlet from said gutter.

27. In a combined clothes washing and extracting machine, a container for clothes and liquid rotatably mounted on a vertical axis, and having side walls which define a surface of revolution about said axis and flare upwardly from the bottom to a level of maximum diameter and there formed with liquid discharge apertures, an upright casing surrounding said container, the bottom of said container being below the normal liquid level in said casing and shielded from contact therewith and an annular removable element carried by the casing wall below the level of said apertures, said element having spaced inner and outer walls connected by a bottom wall and defining a gutter, one of said walls lapping past the inner face of the casing wall and the outer wall being higher than the inner wall, a cover for said machine having a wall portion which laps past the inner face of said outer wall, a washing compartment in said casing below said gutter, and means enclosing the lower part of said container for mechanically agitating the liquid in said casing.

JAMES B. KIRBY.

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Oct. 12, 1943. J. B. KIRBY 2,331,700

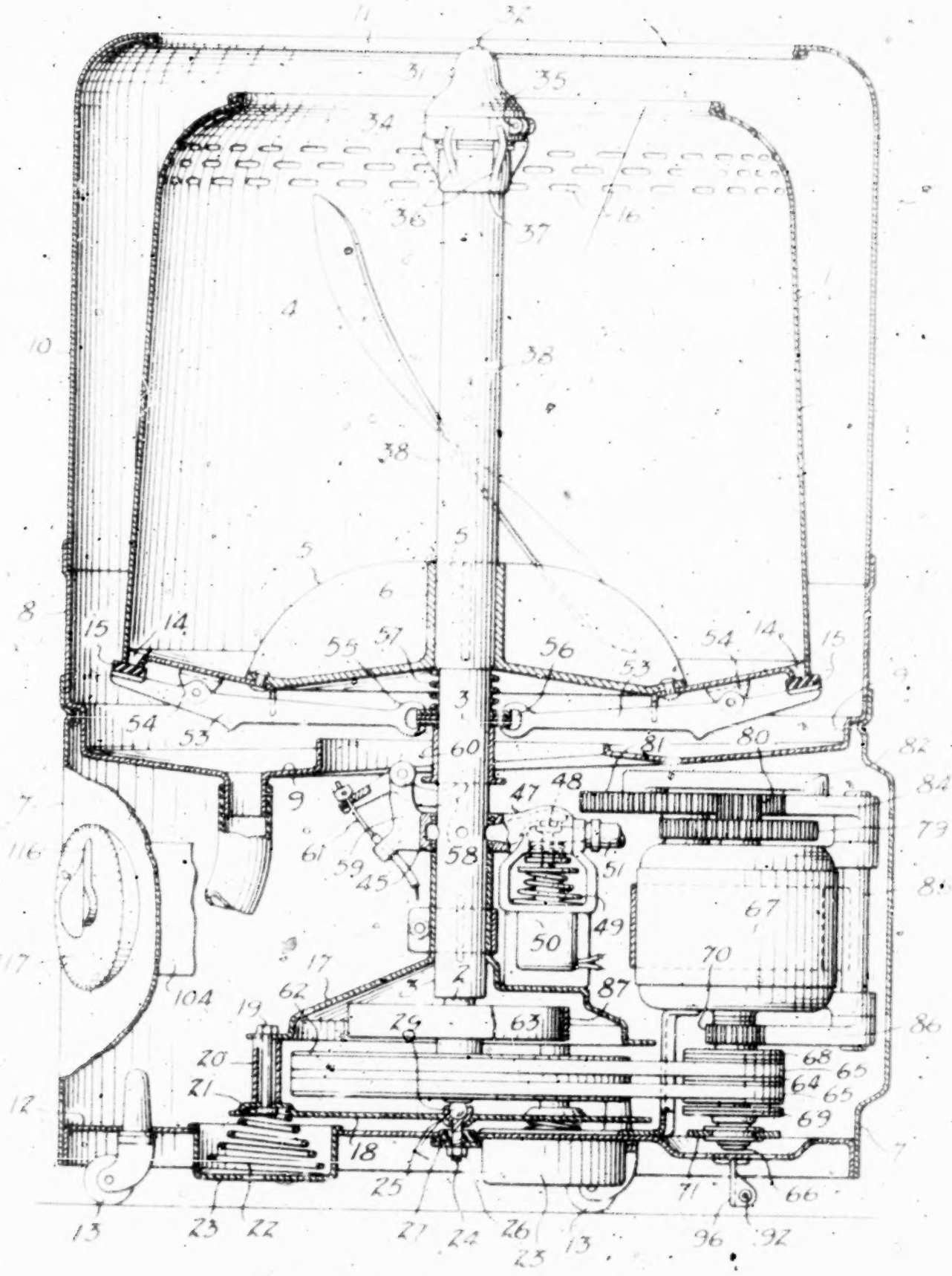

Fig. 1

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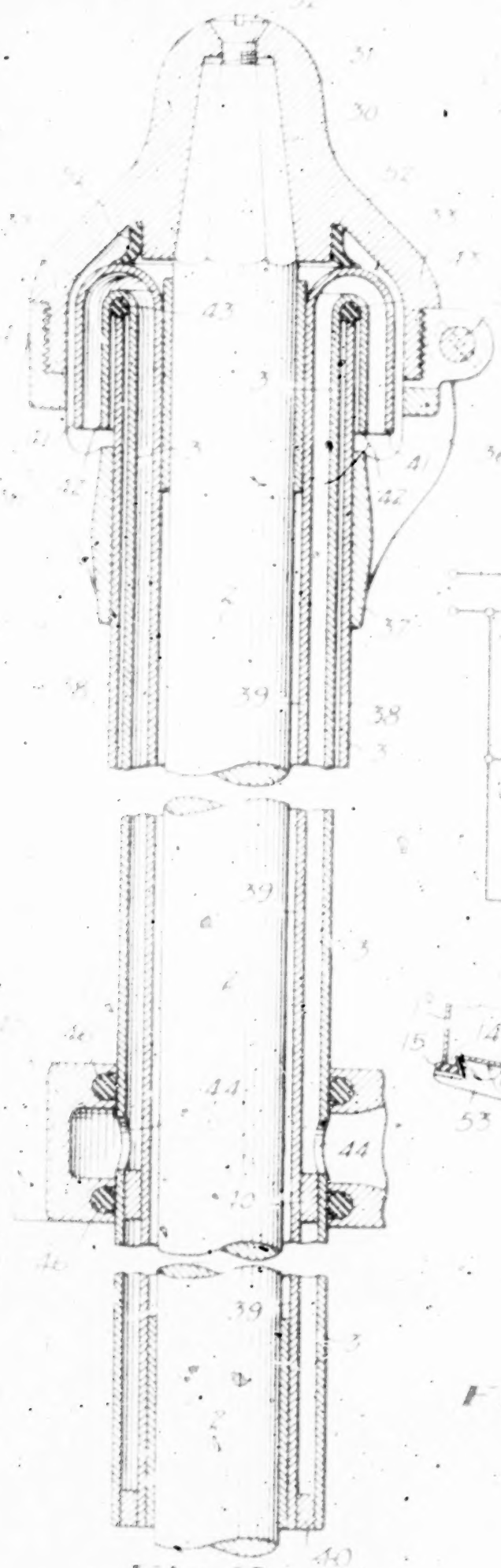

Fig. 5

Fig. 6

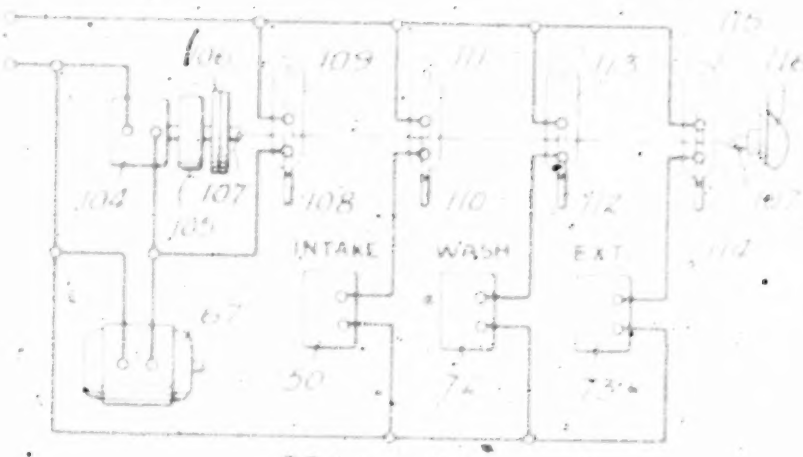

Fig. 4

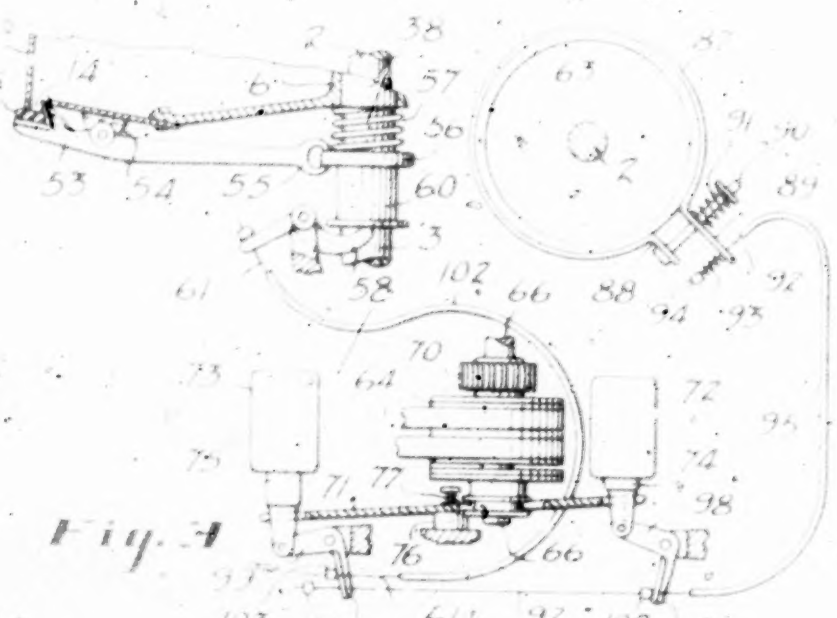

Fig. 3

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Plaintiff's Exhibit 11(j). 509

Oct. 12, 1943. J. B. KIRBY 2,331,700

COMBINED CLOTHES-WASHER AND EXTRACTOR

Filed Oct. 24, 1939 3 Sheets-Sheet 3

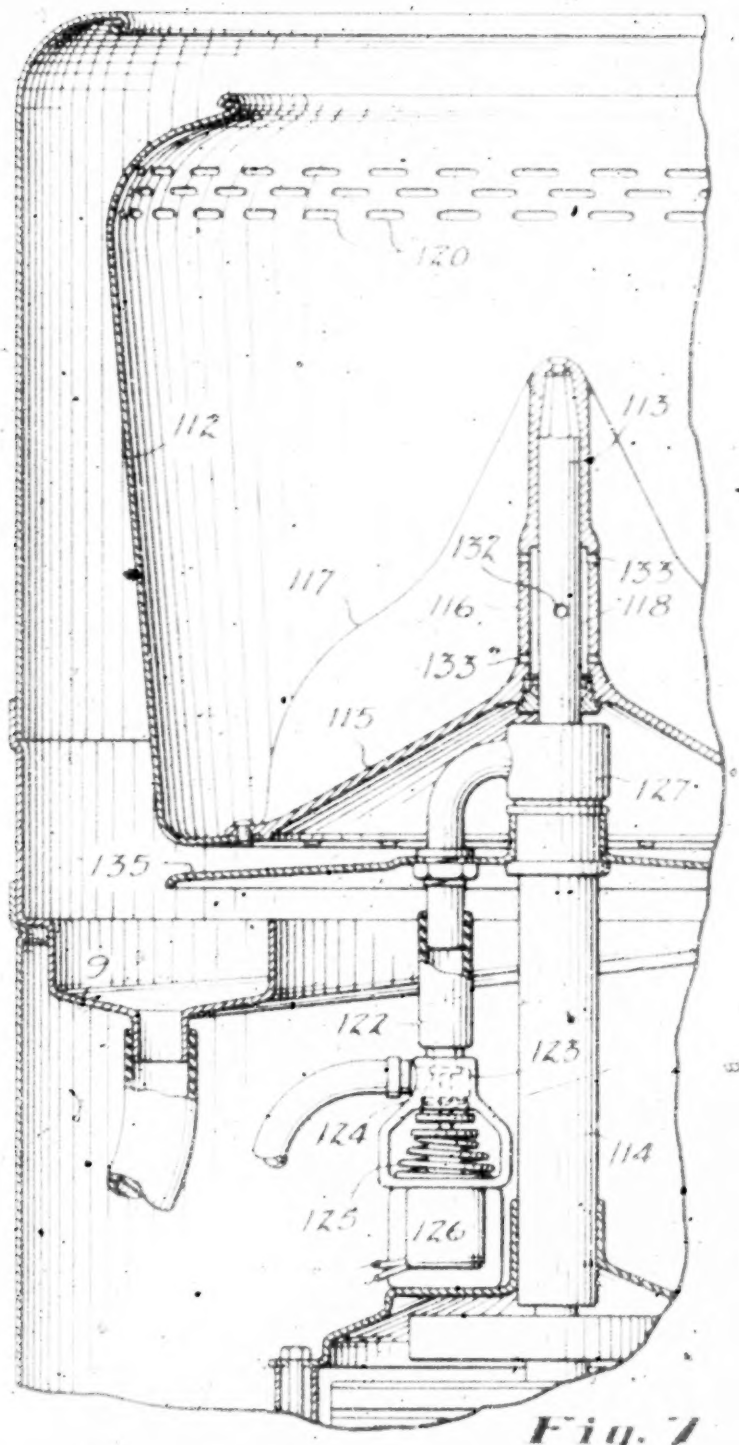

Fig. 7

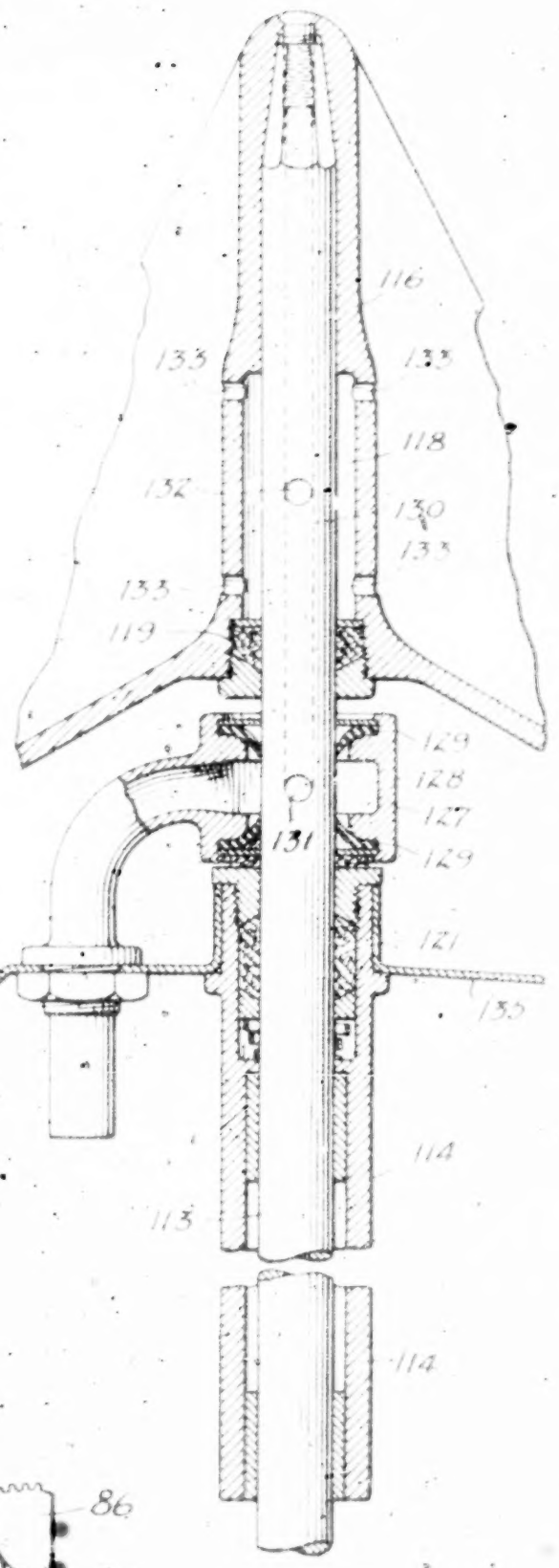

Fig. 8

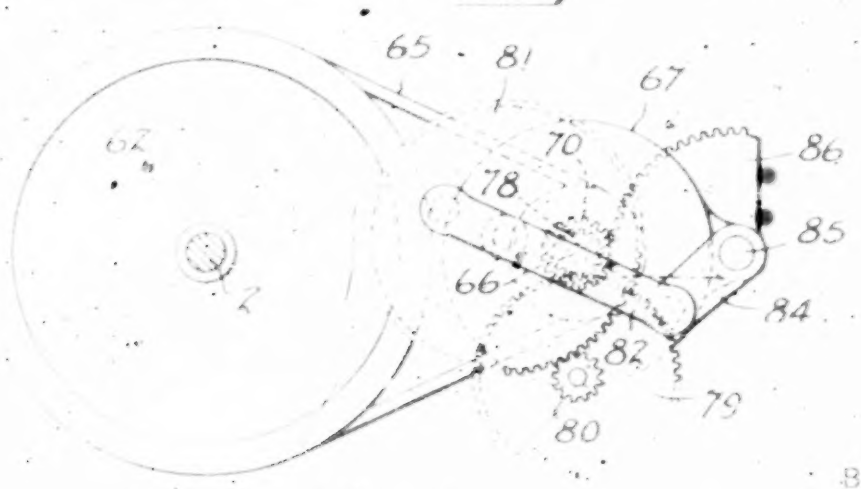

Fig. 9

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Plaintiff's Exhibit 11(p). 510

Patented Oct. 12, 1943 2,331,700

UNITED STATES PATENT OFFICE

2,331,700

COMBINED CLOTHES WASHER AND EXTRACTOR

James B. Kirby, West Richfield, Ohio, assignor to The Apex Electrical Manufacturing Company, Cleveland, Ohio, a corporation of Ohio, as trustee

Application October 24, 1939, Serial No. 300,966

2 Claims. (Cl. 68—23)

This invention relates to a combined washer and drier capable of washing, rinsing, and drying a batch of clothes in a single container without manual manipulation of the clothes during the washing, rinsing, and drying operations, the machine preferably being provided with a timing control for automatically starting and stopping the various operations in proper sequence and at proper time intervals.

An object of the present invention is to provide a mechine employing combined washer tub and extractor which is oscillated during the washing and rinsing operations, which is rotated during the extracting operation, and which has a gyratory support.

Further objects of the invention are to provide improved means for supplying water to the tub for the washing and rinsing operations and to provide improved means for collecting water overflowing from the tub during washing and rinsing operations or forced from the tub by centrifugal force during the drying operation.

A further object of the invention is to provide a drive controlling means by which the actuating shaft may be oscillated for the washing and rinsing operations and continuously driven for drying the clothes and an operative connection between the drive control means and the tub draining means to automatically cause water to be drained from the tub whenever continuous rotation is imparted to the tub.

With the above and other objects in view the invention may be said to comprise the machine shown in the accompanying drawings hereinafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention pertains.

Reference should be had to the accompanying drawings forming a part of this specification, in which:

Figure 1 is a vertical axial section through a combined washing and drying machine embodying the invention.

Fig. 2 is an axial section on an enlarged scale through the upper portion of the supporting pedestal showing the water inlet and the means by which the combined tub and extractor is supported upon the operating shaft.

Fig. 3 is a fragmentary schematic view showing the clutch and brake operating devices and the means for actuating the drain valve.

Fig. 4 is a diagrammatic view showing the timing control mechanism.

Fig. 5 is a plan view of the gearing through which oscillating movement is imparted to the tub.

Fig. 6 is a plan view of the operation indicating dial.

Fig. 7 is a fragmentary axial section showing a combined washer and extractor of modified construction.

Fig. 8 is an axial section on an enlarged scale in the same plane as Fig. 7 through the hub portion of the tub, the water inlet, and the upper portion of the supporting pedestal.

As shown in Fig. 1 of the drawings, the machine is provided with a tub 1 which is centrally supported upon an operating shaft 2 which is journaled in a tubular pedestal post 3. The shaft 2 which carries the tub 1 may be oscillated to impart an oscillating movement to the tub during the washing and rinsing operations and may be continuously rotated to impart a whirling motion to the tub to extract liquid from the clothes within the tub. For agitating the water within the tub during the oscillatory movements of the tub in washing and rinsing, the interior of the peripheral wall of the tub may be provided with one or more agitator vanes 4 and with additional vanes 5 extending radially from the hub portion 6 of the tub and upwardly from the bottom of the tub.

The machine is provided with a housing enclosing the tub and the operating mechanism beneath the tub, the housing having a base portion 7 which encloses the lower portion of the supporting pedestal and the operating mechanism. Above the base portion 7 the housing has a drain portion 8 which has an annular trough 9 underlying the peripheral portion of the bottom of the tub 1 to catch water draining from the tub. Above the drain portion the housing is provided with a tubular shell 10, the upper edge of which is bent inwardly to overhang the space between the tub and shell providing an opening 11 through which access may be had to the tub. The housing is provided with a bottom plate 12, in which may be mounted supporting caster wheels 13.

Adjacent its periphery the bottom of the tub is provided with drain openings 14, which are normally closed by valves 15. Adjacent the top the peripheral wall of the tub is provided with overflow openings 16 through which water and scum or other floating impurities overflow from the tub. The drain trough 9 is positioned to catch water overflowing the top of the tub or draining

through the openings 15 in the bottom of the tub.

The supporting pedestal 3 in which the supporting shaft 2 is journaled is preferably mounted for gyratory movement about a pivot point disposed axially of the pedestal and adjacent the bottom of the housing. The pedestal has a base formed by a flaring conical upper plate 17 secured to the post 3 and a bottom plate 18 which is rigidly attached to the plate 17 by bolts 19, the bottom plate 18 being spaced from the plate 17 by sleeves 20 surrounding the bolts 19. The bottom plate 18 is provided on its underside adjacent its periphery with a suitable number of spaced recesses 21, these recesses being preferably positioned to receive the lower ends of the bolts 19 and providing seats to receive the upper small ends of conical coil springs 22 which are seated at their lower ends in wells 23 provided in the bottom plate 12 of the housing. The pedestal is pressed down against the cushioning springs 22 by means of a central anchoring pivot bolt 24 which has a ball shaped head 25 fitting in a recess in plate 18. The bolt 24 extends through the bottom plate 12 and is provided with a nut 26 at its lower end which is screwed against a rubber washer 27. By adjusting the bolt 24 the tension of the cushioning springs 22 may be increased or decreased.

The lower end of the shaft 2 rests upon a bearing ball 29 seated in the head 25 of the anchor bolt, and the shaft 2 has a tapered upper end portion 30 which is of polygonal cross section and fits into a correspondingly shaped socket in a cap 31 which is secured to the upper end of the shaft by means of a screw 32. The cap 31 has a peripheral depending flange 33 which is threaded at its lower end to receive an internally threaded contractible ring 34 which may be positively locked to the cap 31 by means of a clamping bolt 35. The ring may be made contractible by means of an axial slot and the bolt 35 extending across the slot acts to contract the ring upon the flange. The ring 34 has depending arms 36 which carry a collar 37 which is rigidly attached to the upper end portion of a tubular sleeve 38 which is attached at its lower end to the hub portion 6 of the tub bottom. The tubular post 3 extends to near the top of the shaft 2 and into the space within the flange 33 of the cap and an inner sleeve 39 of smaller diameter than the post 3 is fixed to the tubular post 3, spacing collars 40 being provided between the post 3 and sleeve 39. Within the flange 33 of the cap the sleeve 39 has a flange 41 at its upper end which extends outwardly and downwardly within the flange 33 of the cap, and the post 3 has a flange 42 at its upper end which extends outwardly and downwardly within flange 41.

The annular space between the tubular post 3 and the sleeve 39 provides a water passage through which water may be delivered into the tub, the annular passage having a downwardly directed outlet into the tub through the space between the depending flanges 41 and 42. The sleeve 38 extends into the space between the down-turned flange 42 and the tubular post 3 and a sealing ring 43 may be provided between the upper edge of the sleeve 38 and the flange 42 to prevent passage of water into the space between the sleeve 38 and post 3. The post 3 is provided below the bottom of the tub with circumferentially spaced apertures 44 which communicate with an annular passage formed by an internally channelled collar 45 which fits upon the exterior of the post 3 and which is provided with sealing rings 46 above and below the channel thereof to prevent escape of liquid through the space between the collar and sleeve. The water inlet collar 45 is connected to a fitting 47 which is provided with a valve 48 which is normally held in closed position by a spring 49 and which may be actuated in opposition to the spring 49 by a solenoid 50. The valve fitting 47 is connected to a flexible water supply conduit 51 through which water under pressure may be conducted from a suitable source of supply. To prevent passage of water into the space between the sleeve 39 and shaft 2, a sealing ring 52 may be interposed between the cap 31 and the flange 41 of the sleeve 39.

The tub drain valves 15 are carried by outer ends of levers 53 which are pivoted intermediate their ends to brackets 54 secured to the bottom of the tub. The inner ends of the levers 53 have forks 55 which straddle a group of relatively rotatable washers 56 slidably mounted on the exterior of the post 3. The washers 56 are pressed downwardly by a spring 57 interposed between the washers and the bottom of the tub which serves to normally hold the valves 15 in closed position. The valve levers are actuated in opposition to the spring 57 by means of a lever 58 which is pivoted to a bracket 59 secured to the post 3 and engaging the lower end of a flanged sleeve 60 which is slidable on the post 3 and engages the underside of the washers 56. The lever 58 is actuated to lift the sleeve 60 and open the valves 15 by means of a pull cable 61.

The shaft 2 is actuated through a pulley 62 fixed to the lower end of the shaft 2 within the base of the pedestal, a brake wheel 63 being attached to the shaft immediately above the pulley 62. The shaft is driven from a pulley 64 through belts 65 running over the pulleys 62 and 64. The pulley 64 is mounted on the lower end of the vertically disposed shaft 66 of an electric motor 67 which is suitably supported in the housing. The pulley 64 is slidably mounted on the shaft 66 for movement from a neutral position into engagement with an upper clutch disc 68 or with lower clutch disc 69. The upper clutch disc 68 is fixed to a gear 70 which is rotatable with respect to the motor shaft and the lower clutch disc 69 is fixed to the motor shaft. The pulley 64 is shifted into engagement with one or the other of the clutch discs by means of a shifter lever 71 which is adapted to be actuated by either of two solenoids 72 or 73, which have armatures 74 and 75 engageable with opposite ends of the lever, the lever 71 being rocked upon fulcrum blocks 76 against which it is held by springs 77. The springs 77 normally hold the lever 71 against the flat tops of the blocks in which position of the lever the pulley 64 is held in neutral position. The clutch mechanism is shown and described in somewhat greater detail in my co-pending application Serial No. 300,965, filed of even date herewith.

The gear 70 is operated by the motor 67 with periodic reversal of movement by means of gearing connecting the upper end of the motor shaft 66 to the gear 70. The shaft 66 has a pinion 78 fixed to its upper end which meshes with a gear 79 carried on a shaft supported by the motor casing. A pinion 80 rotates with the gear 79 and meshes with a gear 81 carried by a second shaft supported by the motor casing. A connecting rod 82 is pivotally connected at one end to the gear 81 and at its opposite end to a crank arm 84

fixed to the upper end of a vertical shaft 85 mounted at one side of the motor casing. The shaft 85 carries a gear segment 86 at its lower end which meshes with the gear 70. An oscillating motion is transmitted to the shaft 85 by the connecting rod 82 and the gear 70 is alternately turned in opposite directions by the gear segment 86.

When the pulley 64 is engaged with the upper clutch disc 68 an oscillating movement is imparted to the shaft 2 and tub 1 and when the pulley 64 is engaged with the lower clutch disc 69, continuous rotation is imparted to the shaft 2 and tub 1. The shaft 2 is held stationary when disconnected from the driving motor by means of a brake band 87 which extends around the brake wheel 63 and has a flanged end 88 which is anchored and a flanged end 89 adjacent thereto which is movable, the flanged ends of the band being connected by a bolt 90 and normally pressed together to tighten the band on the brake wheel by means of a spring 91. The brake band may be actuated to release the brake wheel by means of a pull cable 92 which extends through the flange 89 and has a yielding connection therewith through a spring 93 interposed between the flange 89 and a knob 94 attached to the cable. The pull cable 92 is guided through flexible tubing 95 through the bottom 12 of the housing and is threaded through downwardly extending arms 96 and 97 of bell crank levers 98 and 99 which are connected to the lower ends of the solenoid armatures 74 and 75. Adjacent the arms 96 and 97 the cable 92 has knobs 100 and 101 attached thereto which are so disposed with respect to the bell crank arms that either is engaged by the adjacent arm upon actuation of the solenoid to which the arm is attached. Actuation of either of the solenoids to cause oscillation of the shaft or continuous rotation of the shaft causes actuation of the pull cable 92 to release the brake, the brake being automatically applied by the spring 91 when both solenoids are de-energized and the pulley 64 is moved to neutral position by the springs 77. The cable 61 attached to the drain valve actuating lever is guided through flexible tubing 102 through the bottom of the housing and is threaded through the arm 97. Upon actuation of the arm 97, the arm engages a knob 103 on the pull cable to exert a pull on the cable and open the drain valves.

In the operation of the machine a batch of clothes is placed in the tub 1 and water heated to a suitable temperature is delivered into the tub through the supply conduit 51 by actuating the solenoid 50 to open the inlet valve and permit water to flow through the annular passage-way in the pedestal and to be discharged downwardly from the under side of the cap into the tub. When sufficient water has been supplied to the tub, solenoid 72 is energized to actuate the clutch lever 71 and engage the driving pulley 64 to the upper clutch disc 68 and the tub 1 and shaft 2 are oscillated to agitate the water and clothes in the tub for a period of time sufficient to wash the clothes. During the washing operation the solenoid 50 may be actuated from time to time to admit additional water to the tub which will cause water to overflow through the openings 16 to clear scum from the water in the tub. After the washing operation the solenoid 73 may be energized to operate the shaft 2 through the continuously rotating clutch disc 69 and to simultaneously open the drain valves 15. After extracting the suds from the clothes, the shaft 2 may be again oscillated while rinse water is fed into the tub through the supply conduit 51. After the rinsing operation the drain valves are again opened and the tub is continuously rotated to dry the clothes.

Means is preferably provided for causing the necessary operations in proper sequence. This may be accomplished by means of a timing mechanism controlling the motor 67 and solenoids 50, 72, and 73. The timing mechanism may be operated by a clock motor 104 connected through reducing gearing 105 and a clutch 106 to a shaft 107. The shaft 107 is provided with a series of cams which control the various operations, a cam 108 being provided for operating a switch 109 controlling the clock motor 104 and driving motor 67, a cam 110 being provided for operating a switch 111 controlling the solenoid 50 which operates the water inlet valve, a cam 112 operating a switch 113 to energize the solenoid 72 to cause oscillation of the tub 1, a cam 114 controlling the switch 115 for energizing the solenoid 73 which connects the shaft 2 and tub 1 to the continuously rotating clutch element for the drying operation and which simultaneously opens the drain valves. The outer end of the shaft may be adjusted manually to advance or retard the operation of the various switches, the handle 116 being positioned to move over a dial 117 upon which is indicated the various operations being effected in one revolution of the shaft 107 in the sequence indicated on the dial.

In Figs. 7 and 8 of the drawings there is shown a modified form of combined washer and extractor tub provided with water supply and draining devices which differ somewhat from the devices heretofore described. In the modified construction a combined washer and extractor tub 112 is provided which is supported by an operating shaft 113 which is oscillated or rotated by driving means such as hereinbefore described and which is journaled in a pedestal post 114 which has a base portion yieldably supported to permit gyratory movements as in the modification first described.

The tub 112 has a re-entrant conical bottom 115 provided with an integral hub portion 116 projecting upwardly into the tub, agitator vanes 117 being formed integrally with the bottom and hub portion. The hub portion 116 is bored to receive the upper end of the shaft 113 and is secured to the shaft for rotation therewith. At its lower end the hub portion 116 is counterbored to provide a chamber 118 surrounding the shaft and a gland 119 is provided in the lower end of the chamber to prevent leakage of water through the space between the hub and shaft.

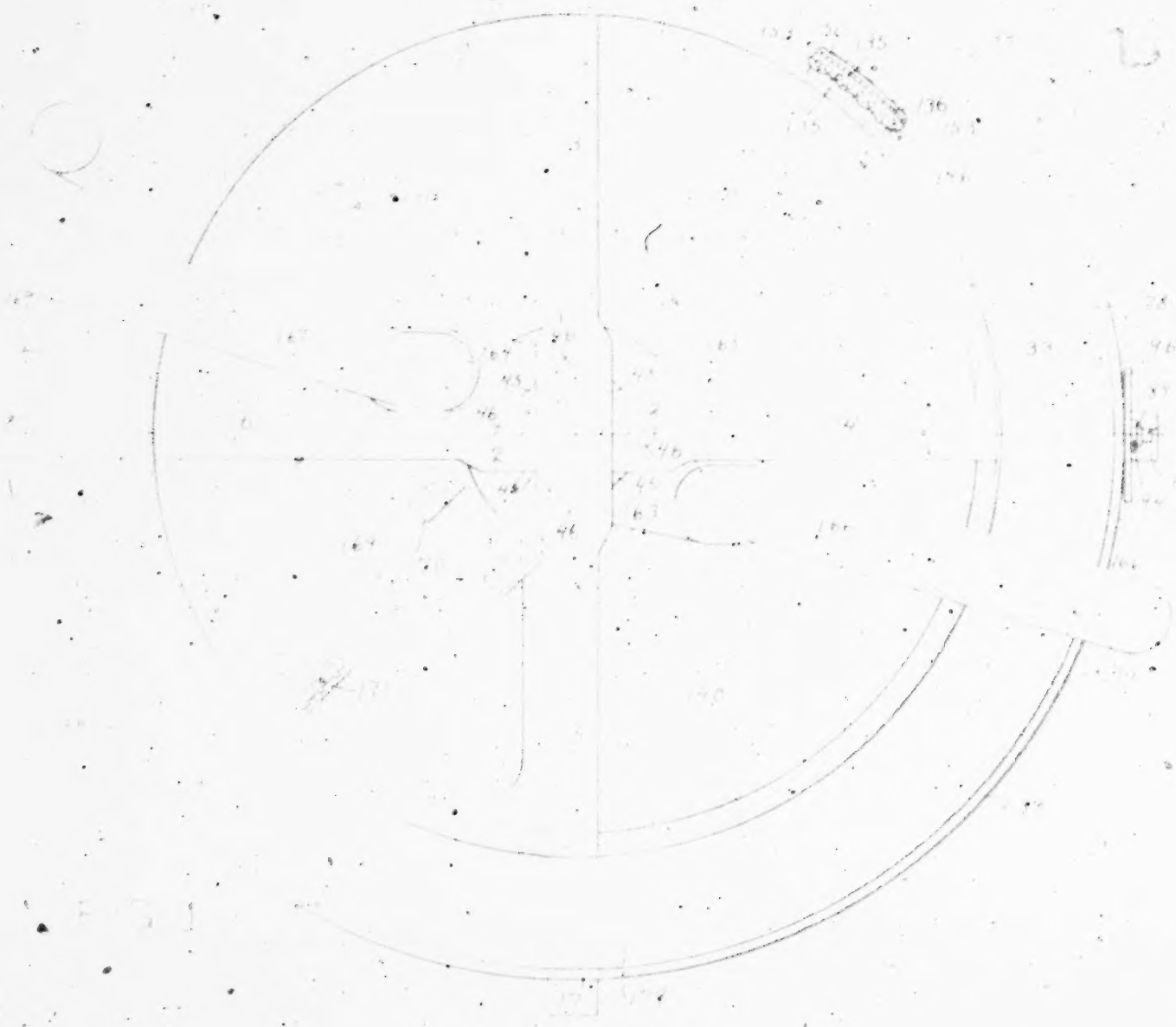
The tub 112 is provided with one or more rows of overflow openings 120 adjacent the top of its peripheral wall through which water may overflow during washing or rinsing operations and through which the water is drained out of the tub during the drying operation, the peripheral wall of the tub being preferably of gradually increasing diameter toward the top to facilitate the discharge of water during the drying operation.

The tubular pedestal post 114 terminates below the bottom of the tub and a gland 121 is provided between the shaft and post to prevent passage of water into the pedestal. Water is supplied to the tub for washing and rinsing through a suitable flexible supply conduit 122 which may be connected to a suitable source of water such as a household water supply system. The conduit 122 is connected to a fitting 123 which has a valve

Jan. 18, 1944. L. D. M. CLEARY 2,339,345

LAUNDRY MACHINE

Filed April 27, 1940 3 Sheets-Sheet 1



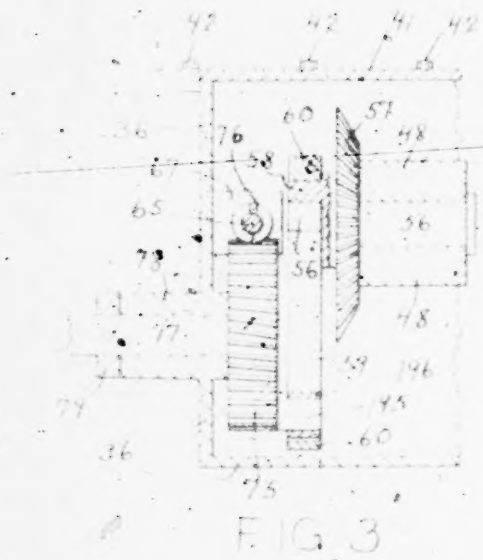


FIG. 3

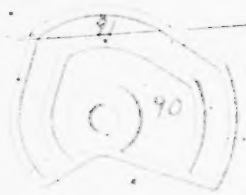


FIG. 4

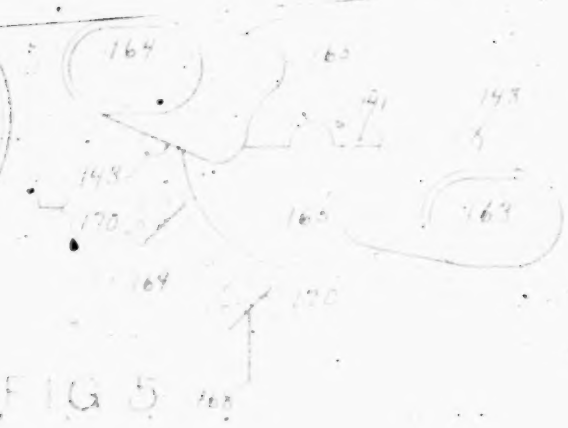


FIG. 5

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LAUNDRY MACHINE

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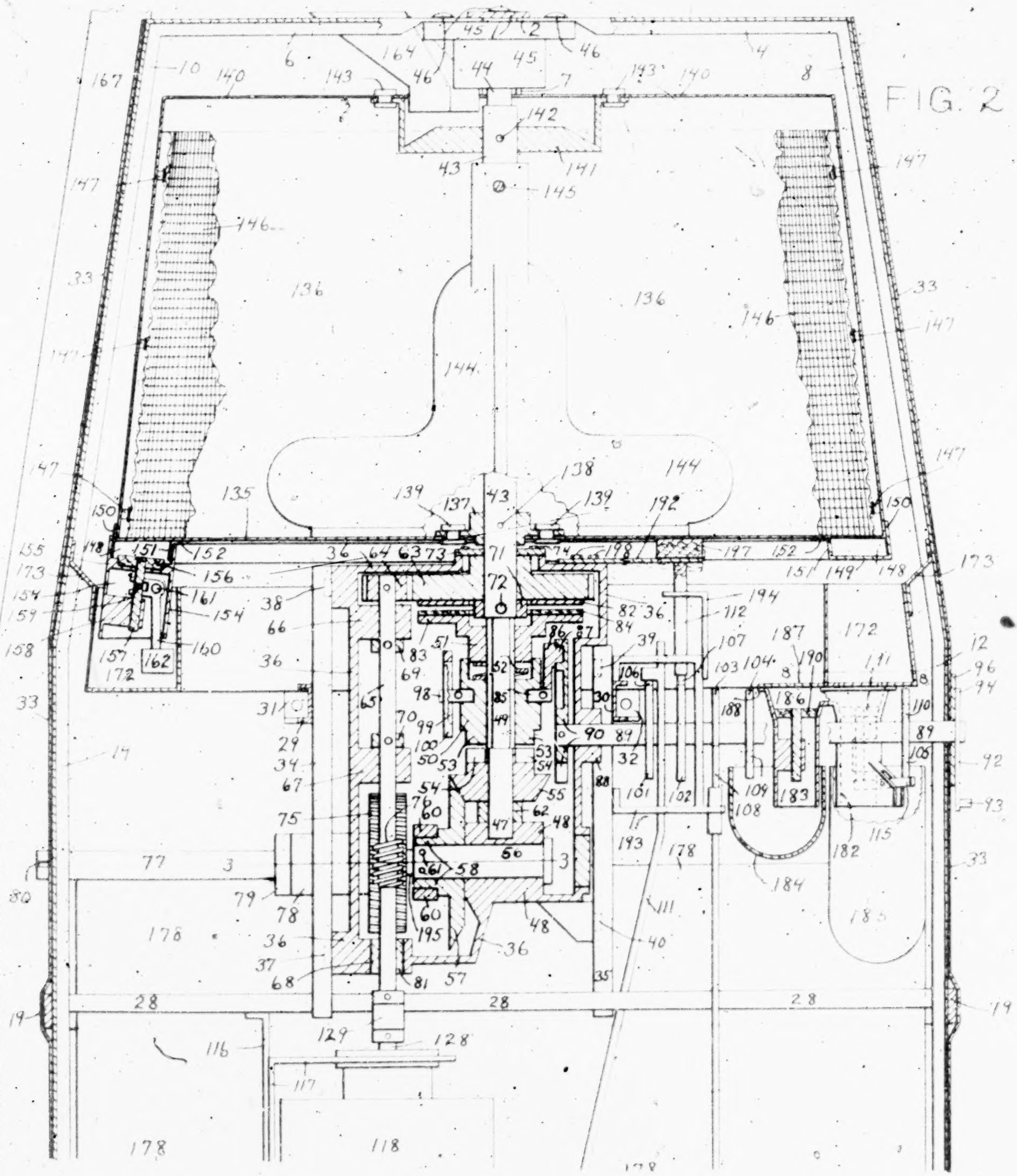
FIG. 2



Jan. 18, 1944. L. D. M. CLEARY 2,339,345

LAUNDRY MACHINE

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FIG. 7

FIG. 6

FIG. 8

Patented Jan. 18, 1944 2,339,345

UNITED STATES PATENT OFFICE

2,339,345

LAUNDRY MACHINE

Lorin D. McCleary, Indianapolis, Ind.

Application April 27, 1940, Serial No. 331,971

6 Claims. (Cl. 68—23)

My invention relates to improvements in laundry machines, and the objects of my invention are, to provide a laundry machine that will wash, rinse and damp dry fabrics and garments, and that will supply a power drive for a rotary ironer at a convenient height from the floor, whereby the operator can be seated while attending the ironer;

That will perform all the work of washing, rinsing and damp drying, except placing of the articles into the processing vessel and removing them therefrom;

That when operating as a washer and an extractor, will automatically distribute the contents of the vessel evenly therein, thereby maintaining a centrifugal balance of the vessel and its contents;

That when operating as an extractor, will employ both the force of gravitation and the centrifugal force of rotation, in one direction downward, thereby augmenting the effect of extracting the fluid from the fabrics, and by means of a screen spaced from and fixed to the inner side wall of the processing vessel, will discharge the top suds from the vessel;

That will perform all the operations of washing, rinsing and damp drying in one vessel, thereby simplifying construction, and lessening the cost of production of a machine of this class;

That can be used either where there is no water pressure supply available, or in modernized buildings;

That will be economical in the use of water, in the cost of heating water, and in the use of soap and other solvents and materials, used in washing;

That, additional to the processing vessel, will be equipped with a storage tank for soap water, a storage tank for rinse water, and a circulating system by means of which the washing solution and the rinsing solution, can be transferred to and from the processing vessel, to their respective tanks, by mechanical operation without mingling, and by this means used over several times for washing and rinsing successive batches of articles;

That will have a pumping system with connections between the processing vessel and storage tanks, whereby the fluid from all these containers, can be mechanically discharged into the sink or drain; thereby enabling the operator to refill these containers as ofter as desired, and that will mechanically discharge the fluid from all these containers when the job is finished;

That will be of such construction as will operate when desired, with a centrally positioned agitating element having outwardly ... ding vanes, and will permit of a simplified and more substantial form of this type of agitator, by permitting it to be statically connected with the processing vessel;

That will inclose in one combination and within one outer shell, a processing vessel and storage tanks, thereby employing their weight and that of their contents as ballast to steady the machine when in operation; and that will retain heat in this enclosure; and for economy and convenience in saving floor space.

A further object of my invention is to provide a power transmission unit in one enclosed housing, that will serve both, to revolve and to oscillate the processing vessel; and that will oscillate in a manner different from that affected by similar mechanisms commonly in use, in the respect that the oscillation will be less uniform, and that the reverse motions will be performed at a higher rate of speed, thereby increasing the turbulence of the contents of the vessel.

A still further object of my invention is to provide a laundry machine of such design as will admit of the use of a control mechanism in which all the operations of washing, rinsing, damp drying, and discharging of the fluid from the vessels, is governed by one lever that turns on a dial which indicates the setting of the lever for each operation, and by this means dispenses with the plurality of levers, handles and buttons commonly used on washing machines, and thereby furnish additional convenience to the operator.

I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a top view of the machine, with a small area of the shell and processing vessel wall broken away, exposing some of the interior construction, including perforations in the bottom of the processing vessel, and diagrammatically showing the disposition of the soap water tank and the rinse water tank in the machine; Fig. 2, a vertical section on the line 2—2, Fig. 1, of the entire machine, except th section of the twin valve assembly shown which is on a vertical plane lying a little back of line 2—2, and with the further exceptions that some of the details of the machine, have been left whole, and part of the screen is broken away to add clearness to the view; Fig. 3, an under view on the line 3—3, Fig. 2, showing a portion of the power unit housing in horizontal section, and exposing some of the working parts; Fig. 4, a face view of the cam plate removed from the machine; Fig. 5, a top view of a portion of the processing vessel cover,

124 normally held closed by a spring 125 and adapted to be opened in opposition to the spring by a solenoid 126. The fitting 123 is connected to a collar 127 surrounding the shaft 113, the collar 127 having an internal channel 128 forming a passage around the shaft and packing rings 129 engaging the shaft above and below the channel to prevent leakage of water. The shaft 113 has an axial passage 130 which has a lateral opening 131 to the channel 128 and a lateral opening 132 to the chamber 118 in the hub 116, the hub having openings 133 through which water is discharged radially into the tub.

During the washing and rinsing operations the shaft 112 and tub 113 are oscillated to agitate the clothes and water within the tub and the valve 124 is opened intermittently to deliver additional water into the tub. The addition of water causes the water to overflow through the openings 120 and clears away scum and other floating impurities through the openings 120. During the extracting operation the rapid rotation of the tub causes the water to collect on the peripheral wall of the tub and flow outwardly through the openings 120. The drain trough 9 carried by the housing catches water draining through the openings 120 during the washing, rinsing, and drying operations.

In order to prevent water dripping from the bottom of the tub into the lower portion of the housing in which the driving mechanism is enclosed, a drip plate 135 of a diameter substantially corresponding to that of the bottom of the tub may be secured to the upper end of the pedestal post. 114. and to the water inlet fitting. The peripheral edge of the drip plate 135 overhangs the trough 9 to discharge any water which drips upon it into the trough 9.

Furthermore, it is to be understood that the particular form of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

What I claim is:

1. A combined clothes washer and extractor comprising an upright shaft, a tub attached to said shaft adjacent its upper end, a drain valve on the tub, an actuating mechanism for oscillating said shaft, a driving means for continuously rotating said shaft, controlling means for disconnecting said shaft from said oscillating mechanism and connecting the same to said driving means, and means connecting the controlling means with said drain valve to open said valve and hold the same in open position during rotation of the tub.

2. A combined washer and extractor comprising a housing, a tub rotatably mounted within the housing, said tub having a peripheral wall which gradually decreases in diameter from the bottom to the top of the tub, said tub having openings adjacent the bottom thereof, valves for opening and closing said openings, radially extending levers connected to said valves, a vertically movable actuating member engaging the inner ends of said levers, means for actuating said member to open and close the valves, means for rotating the tub, means for oscillating the tub, and draining means carried by the housing for collecting water discharged from the tub.

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showing the opening in its central area, the bracket that attaches it to the main shaft, the hose funnels and the port hole lid, all other parts of the structure being removed; Fig. 6, a face view of the control dial removed from the machine and enlarged; Fig. 7, the upper half of the shifting ring which has been detached and removed from the machine, and Fig. 8, a horizontal section on the line 8—8, Fig. 2.

Similar numerals refer to similar parts throughout the several views.

Reference is made to my co-pending application for U. S. Letters Patent, Serial No. 387,475, filed April 8, 1941, and which has since terminated in U. S. Letters Patent No. 2,314,155, March 16, 1943.

The main parts of the frame structure of the machine consist of two channel rods which have their central portions 1, 2, flattened where they cross at the top of the machine, and their end lengths formed into horizontal sections 3, 4, 5, 6, slant sections 7, 8, 9, 10, vertical sections or legs 11, 12, 13, 14, and feet 15, 16, 17, 18; thus forming a frame with legs and feet for supporting the machine. Welded to the legs is the hoop 19, and near the floor, flat brace rods 20, 21, 22, 23, are bolted to them with the bolts 24, 25, 26, 27.

Additional frame structure consists of cross brace 28, of channel rod that has its ends welded to hoop 19; channel ro cross braces 29, 30, that have their end portions 31, 32, bent and riveted to the shell 33; channel rod vertical support 34, that is welded to the rods 28, 29, and channel rod vertical support 35, that is welded to the rods 28, 30.

The power unit housing 36, is secured to the rods 34, 35, by the bolts 37, 38, 39, 40, which hold it firmly in the machine, and its cover 41 is secured to it by the bolts 42, 42, etc.

The main shaft 43, has its upper end section 44, reduced in diameter, which turns in the ball bearing 45, that is secured to the frame with the bolts 46, 46, 46, 46, and its lower end section 47, which also is reduced in diameter, turns in socket bearing in bearing block 48. In preferred construction a ball bearing would be used in this place.

Four flats 49, 49, 49, 49, at relatively 90° planes, are cut on the main shaft on which are adapted to slide clutch collars 50, 51, that are provided with center holes to fit the flatted section. These collars are cushioned apart with coil spring 52. Collar 50, is provided with clutch jaws 53, 53, 53, 53, which are mated to the clutch jaws 54, 54, 54, 54, on gear 55. This gear is adapted to oscillate on section 47, of the main shaft, when idling. Shaft 56, that is journaled in bearing block 48, has keyed to one end, oscillating gear 57, which has constant mesh with oscillating gear 55. The end portion 58, of the hub of gear 57, is flatted to fit into the slot 59, provided in crank arm 60, Figs. 2, 3, that is secured thereto with the pins 61, 61. An end side portion of shaft 56, is cut away to permit the slot 59 to extend close to the axis of the shaft.

The end play of oscillator gear 55, is limited by the collar 62, and shoulder where sections 47, 49, of the main shaft join.

Spinner gear 63 is adapted to rotate on the main shaft when idling, and has constant mesh with spinner gear 64, that its keyed to worm shaft 65. This shaft is journaled in bearing blocks 66, 67, 68, and has its end play limited by the collars 69, 70, that are pinned to it. The end play of spinner gear 63, is limited by the collar and pin 71, 72, respectively, and the cap and screw bolts 73, and 74, 74, respectively.

The worm wheel 75, has constant mesh with the worm 76, and is keyed to the worm wheel shaft 77, that is journaled in bearing block 78. End play of the worm wheel shaft is limited by bearing block 78, and the collar 79, which is set on the shaft. This shaft extends outward through the shell 23, and has a groove 80, on its end portion, that is adapted to fit a driving connection of a rotary ironer. A thick walled bushing 81, is used in bearing block 68, which permits the worm shaft to be inserted from below when assembling the power unit.

On the lower side of spinner gear 63, is fixed the clutch disk 82. Integral with the clutch collar 51, is the flange 83, on which is fixed a thickness of friction fabric 84.

Shifting ring 85, rides in an annular groove in clutch collar 50, and permits the collar to turn when it is oscillated or rotated by the main shaft. The upper half of the shifting ring is removed and is shown in Fig. 7, the screw bolts attaching it to the lower section, having first been taken out. Integral with the lower half of the shifting ring is the arm 86, bearing the cam pin 87. Journaled in bearing block 88, is control shaft 89, that has keyed to its inner end cam plate 90, Figs. 2, 4, in which is provided the cam groove 91, which is constituted of three arc sections; the inner or oscillator arc; the intermediate or neutral arc; and the outer or spinner arc; relatively of unequal radii from and concentric with the control shaft; and of two slant or shift sections joining the arc sections Fig. 4. The function of the cam groove is to slide over the cam pin 87, causing it to move toward and from the control shaft, and to hold it in fixed positions, thereby, controlling the functions of the clutches on the main shaft, through the linkage of the shifting ring 85, the collars 50, 51, and the coil spring 52, Figs. 2, 4, 6. The outer end of the control shaft has fixed to it the dial arm 92, having a handle 93, a pointer 94, and a lock pin 95. The dial arm is of spring material, and holds the lock pin pressed against the dial plate 96, or from time to time throws it into and holds it in the holes 97, 97, etc., as required in the operation of the machine, as the attendant swings the arm and sets the pointer at the positions indicated on the dial, for washing, rinsing, extracting, pumping, etc. In the drawings, the dial arm is shown in vertical position with the pointer up. Extending from the left side of the shifting ring is retaining lug 98, that is adapted to slide in guide slot 99, provided in block 100, that is cast integral with the back wall of housing 36.

Worm wheel 75 bears crank pin 195, which turns in and drives slide block 196 in reciprocating motion in slot 59 provided in crank arm 60, thereby imparting oscillating motion to oscillator gear 57 and its mating oscillator gear 55. Oscillating motion is imparted to the main shaft 43 when the control mechanism thrusts clutch collar 50 downward on the main shaft 43, causing the clutch jaws 53, 53, 53, 53, to mesh with the clutch jaws 54, 54, 54, 54, of oscillating gear 55. Rotary motion is imparted to the main shaft 43, from spinner gear 63, when the control mechanism thrusts clutch collar 51 upward on the main shaft, causing a pressure contact of friction fabric 84 on clutch facing 82 of spinner gear 63.

Cam wheels 101, 102, 103, 104, 105 are fixed to the control shaft and are provided with cams 106, 107, 108, 109, 110, respectively, for actuating

soap water pump lift rod 111, brake push rod 112, rinse water pump push rod 113, soap water valve lift lever 114, Fig. 8, and rinse water valve lift lever 115, respectively.

Bracket 116 is welded to the main frame structure already described, and welded to the vertical side of this bracket is bracket 117. Motor 118 is supported at the ends of its frame by bracket 117. The lower side of this bracket extends beyond the motor frame, forming bearing support 119. Rinse water pump 120 is provided with bracket 121 and swings on hinge joint 122 that is supported by bracket 119 when actuater by push rod 113 that is connected by the pivot joint 123. Soap water pump 124 is provided with bracket 125, and swings on hinge joint 126 when actuated by lift rod 111 that is connected to its bracket by the pivot joint 127.

The worm shaft 65 is connected to the motor shaft 128 by the flexible coupling 129, and keyed to the lower end of the motor shaft is drive pulley 130, which is surfaced with rubber.

Keyed to the pump drive shafts 131, 132 are the driven pulleys 133, 134, respectively, which are swung on and off of driving contact with drive pulley 130 by the rods 111, 113, respectively.

The bottom 135 of the processing vessel 136 is secured to the main shaft by the flanged collar 137, pin 138, and bolts 139, 139, and the cover 140 of the vessel is secured to the main shaft by the bracket 141, pin 142, and bolts 143, 143.

The agitating element 144 is fixed to the processing vessel by set screw 145 that secures it to the main shaft. The screen 146, which forms an annular inside wall for holding the articles being washed and damp dried, is spaced from and secured to the wall of the processing vessel by the studs 147, 147, etc., that are soldered to the wall and to the screen.

An annular recess 148 is provided under the bottom of the processing vessel by the sheet metal structure having a bottom 149, outer side wall 150 that is soldered to the side wall of the processing vessel, and inner side wall 151, which has a turned edge 152 that is soldered to the bottom of the processing vessel. An annular line of perforations 153, 153, etc., through the bottom of the processing vessel, Fig. 1, are for draining the fluid contents of the vessel into the recess.

A drain hole is cut through the bottom of the recess structure, and spout 154 is fitted over it and soldered to the side walls and bottom of the structure surrounding the hole, thereby directing the fall of fluid from the recess 148, through the spout 154, which is provided with valve seat 155, and valve 156, to which is fixed the stem 157, that is adapted to slide in a hole in guide block 158. Cross pin 159 is set in the valve stem, and lift lever 160 swings on the fulcrum pin 161 that is set in the side wall of the spout. The short end of lever 160 is slotted and straddles the cross pin 159, and fixed to its long end is the weight 162, thus forming a centrifugally actuated valve for draining the recess. The weight 162 is graduated to lift the combined weight of the column of water resting on the valve, the valve and valve stem, against the centrifugal force acting on the column of water, when the R. P. M. of the processing vessel is somewhat in excess of the rate of speed at which it oscillates. When balancing the complete assembly that revolves on the main shaft 43, the weight 162 is swung outward to the limit of its motion, thereby having the assembly balanced when spinning and slightly unbalanced when oscillating or at rest.

Soldered to the frame sections 4, 6 are the funnels 163, 164, respectively, the lower ends of which project through the central opening into the processing vessel, permitting the edge of the cover to revolve freely around them without contact. These funnels are adapted to receive the upper ends of the pump discharge hose 166, 167, where they normally rest for returning the soap water and the rinse water from the tanks to the processing vessel, but from where they may be removed and swung over the sink or drain, when the contents of the tanks are to be disposed of. The port hole 168 gives access to the processing vessel and is provided with a lid 169, Figs. 1, 5, that swings on hinges 170, 170, and is tightly secured to the top cover by the latch 171, when closed.

An annular trough 172 is provided for receiving the liquid discharged from the spout 154, which with its valve assembly is adapted to travel freely in the trough when the processing vessel revolves or oscillates. Brackets 173, 173, etc., secure the trough firmly to the frame sections 7, 8, 9, 10.

The lower ends of the hose 166, 167 are connected to the discharge pipes 174, 175, respectively, of the rinse water pump 120 and the soap water pump 124, respectively, and the inlet pipes 176, 177 of the pumps are connected to the rinse water tank 178 and the soap water tank 179, respectively, by the hose 180, 181, respectively. The tanks are seated on and supported by the brace rods 20, 21, 22, 23.

For conducting the soap water, and the rinse water from the discharge pipes 183, 182 to their respective tanks are provided the large pipe 184, that is connected to the soap water tank 179, and the large pipe 185, that is connected to the rinse water tank 178.

Under the annular trough is provided a twin valve assembly that has a common inlet chamber 186. The upper left half of this valve chamber is closed by the cover 187, and the upper right half is closed by the bottom of the annular trough 172, to which the flange 188 is soldered, except where the drain hole 189, Fig. 8, is cut through the bottom of the trough. Valve 190, which opens to discharge the soap water, is actuated by cam 109 and lift lever 114, Figs. 2, 8; and valve 191, which opens to discharge the rinse water, is actuated by cam 110 and lift lever 115; and they drop back into their seats when the cams permit the lift levers to fall.

A brake shoe 197, of flexible substance, is mounted on a wide, flat spring 192 that is bolted to the housing 36 with the screw bolts 198. The spring which normally curves downward at its detached end has been bent upward by the cam rod 112, causing a pressure of the shoe on the bottom of the processing vessel, as shown in Fig. 2; the cam rod being adapted to slide in guide holes in brackets 193, 194, when actuated by the cam 107, or by the reaction of the spring.

In the general design of this machine, the power unit, motor, pumps, cam rods and frame work that support them below the control shaft, all lie in one central plane, leaving the space at each side of this plane, enclosed by the shell available for tanks. The tanks are shaped to conform to these two spaces and are disposed as shown in Figs. 1, 2.

From the foregoing, it will appear clear that the main shaft, processing vessel, screen, agitator, annular recess structure and centrifugal valve frame, are all statically connected, and that in the operations of the machine this structure re-

volves and oscillates on two bearings in which the main shaft turns; and at this point it will be noted, that the cam plate and five cam wheels which are set on the control shaft, govern all operations of the machine in fixed coordination, as the dial pointer is turned from time to time and set in each of the seven positions on the dial, that direct the attendant in operating the machine; and by observing the relation of the dial pointer to the cams, it will be seen that when the pointer is at "Put in and remove clothes," the oscillator clutch and the spinner clutch are neutral; the soap water pump, and the rinse water pump are at rest; the brake is on; and the soap water valve, and the rinse water valve are closed; that when the pointer is at "Wash," the oscillator clutch is in mesh; the spinner clutch is neutral; the brake is open; both pumps are at rest; and the soap water valve, and the rinse water valve, are closed; that when the dial is set at "Extract soap water," the oscillator clutch is neutral; the spinner clutch is on; the brake is open; the soap water valve is open; the rinse water valve is closed; and the pumps are at rest; that when the pointer is at "Pump rinse water and rinse," the oscillator clutch is in mesh; the spinner clutch is neutral; the brake is open; the soap water pump is at rest; the rinse water pump is in drive contact; and the soap water valve, and the rinse water valve are closed; that when the pointer is at "Extract rinse water," the spinner clutch is acting; the oscillator clutch is neutral; the brake is open; the rinse water valve is open; the soap water valve are closed; and that when the pointer that when the pointer is at "Pump soap water," the oscillator clutch, and the spinner clutch are neutral; the brake is on; the soap water pump is in drive contact; the rinse water pump is at rest; and the soap water valve, and the rinse water valve is closed; and that when the pointer is at "Pump rinse water," the oscillator clutch, and the spinner clutch, are neutral; the brake is on; the rinse water pump is in drive contact; the soap water pump is at rest; and the soap water valve, and the rinse water valve are closed.

From the operations just described, it will be noted that in shifting for changing the motion of the processing vessel, from oscillating to rotating, or vice versa, the brake is automatically applied during the shifting interval.

In operation, my laundry machine functions as follows: It is assumed that the pointer **94**, is set at "Put in and remove clothes," where it is always left after finishing a washing; and that the power has been turned on the motor and that the working parts of the power unit are idling. The lid **169**, is now swung open, and a batch of clothes and the washing solution are put in the vessel, which can be filled as high as the set screw **145**, in the agitator. The dial pointer **94**, is then set at "Wash," which sets the processing vessel in oscillating motion, agitating the contents of the vessel and washing the clothes. While this batch is washing, the rinse water tank is filled through the inlet pipe **195**, with a quantity of clear water, equal to the quantity of soap water, by inserting the supply hose into the pipe. In case, piped water pressure is not available, the tank can be filled by inserting a funnel into the inlet pipe, to receive the water poured from a vessel. After the batch of clothes has been washed, the pointer is set at "Extract soap water," which changes the motion of the processing vessel to rotating. When it has attained a speed of rotation somewhat in excess of its oscillating speed, centrifugal force acting on the weight **162**, opens the centrifugal valve **190**, while centrifugal force imparted to the contents of the vessel, causes its liquid contents to rise on the side wall of the vessel, forming an inverted air cone in the upper central space of the vessel, while the fluid contents are discharged through the perforations **153**, **153**, etc., in the bottom of the vessel, into the annular recess **148**, thence through the spout **154**, the annular trough **172**, discharge pipe **183**, tank pipe **184**, and into soap water tank **179**. The agitating action that preceded the extracting action, distributed the fabrics evenly in the vessel, and the extracting action that followed forced and held them against the lower portion of the screen, thereby obstructing rapid flow of the liquid contents through this part of the screen, and causing it to flow through the screen above the fabrics, and down through the space between the screen and wall of the vessel; while the suds floating on the surface was thrown outward against the wall of the vessel and carried down with the flow of soap water.

The pointer is next set at "Pump rinse water and rinse," which again sets the processing vessel to oscillating, while simultaneously, the rinse water pump, pumps the water from the rinse water tank, through its discharge hose **166**, and the hose funnel **163**, into the processing vessel; during which interval, the clothes have been rinsed. The pointer is then set at "Extract rinse water," which changes the motion of the processing vessel to rotating. The process of extracting the rinse water is the same as that of extracting the soap water, except that rinse water valve **191**, Figs. 2, 8, is opened, and the water is conducted through discharge pipe **182**, and tank pipe **185**, into the rinse water tank.

Next, the pointer is again set at "Put in and remove clothes," and the clothes are then removed from the processing vessel.

Each successive batch of clothes is washed, rinsed and extracted in the same manner, except, that since the soap water will have been discharged into the soap water tank, after washing the first batch, it will be necessary to first set the pointer at "Pump soap water," which will set the soap water pump in operation, and pump the soap water back into the processing vessel, through the discharge hose **167** and the funnel **164**.

When the last batch of clothes has been put through the machine, the end of the soap water hose is removed from its funnel and swung over the sink or drain, and the pointer is then set at "Pump soap water," which discharges the soap water from its tank.

The rinse water is then discharged into the sink or drain in like manner, by setting the pointer at "Pump rinse water."

If it is desired to use a fresh supply of soap water, and of rinse water for each batch of clothes, the tanks are discharged after each batch has been put through the machine, and the processing vessel and the rinse water tank are filled as when starting to wash the first batch of clothes.

What I claim is:

1. In a laundry machine comprising a vessel for containing liquid and fabrics to be washed, rinsed and damp-dried therein, an agitating element provided within said vessel, said vessel being rotatably mounted on a vertical axis, means for discharging the liquid from said vessel, a trough disposed below and near the periphery of

said vessel and adapted to receive the liquid discharged from said vessel, a tank for wash liquid and a tank for rinse liquid disposed below said trough, means for selectively conducting the liquid from said trough into either of said tanks, a motor, a driving mechanism including clutch means intermediate the said motor and the said vessel for actuating said agitating element and for revolving said vessel, a control shaft bearing cam means and an operating handle for selectively interlocking said driving mechanism with said agitating element to actuate said agitating element to wash the fabrics, and for selectively interlocking said driving mechanism with said vessel to revolve said vessel to expel the liquid from said fabrics and to discharge the liquid from said vessel, and to coordinately actuate said selective conducting means to direct the liquid into either of said tanks.

2. A laundry machine comprising a tub mounted to be rotatable about a vertical axis and having a fluid retaining side wall and floor, a foraminated wall around and spaced inwardly from the side wall of the tub and held in fixed relation thereto; and means turning said tub about its axis selectively in a spinning or oscillatory manner; said tub and foraminous walls being respectively frusto-conical in shape with their major diameters at the tub floor; said foraminous wall terminating with its top edge below the top of the tub wall to leave a substantially unobstructed annular opening therebetween for foraminous wall overflow of fluid and soap suds; and said tub floor being provided with fluid discharge means around its peripheral portion between said tub and foraminous walls.

3. A laundry machine comprising a tub mounted to be rotatable about a vertical axis and having a fluid retaining side wall and floor; a foraminated wall around and spaced inwardly from the side wall of the tub and held in fixed relation thereto; and means turning said tub about its axis selectively in a spinning or oscillatory manner; a fluid collecting channel carried by the tub and extending annularly around a peripheral portion of said tub floor; said floor being arranged to permit fluid entering between said tub and foraminous walls to flow into said channel; a fluid discharge valve in said channel; and weight and lever means for opening said valve actuated by centrifugal force created through a predetermined speed of turning of said tub.

4. A laundry machine comprising a tub mounted to be rotatable about a vertical axis and having a fluid retaining side wall and floor; a foraminated wall around and spaced inwardly from the side wall of the tub and held in fixed relation thereto; and means turning said tub about its axis selectively in a spinning or oscillatory manner; a fluid collecting channel carried by the tub and extending annularly around a peripheral portion of said tub floor; said floor being arranged to permit fluid entering between said tub and foraminous walls to flow into said channel; an annular trough and shiftable parallel to said axis fixed in position under said channel; a fluid discharge valve in said channel in the path of said trough and shiftable parallel to said axis; and weight and lever means automatically opening said valve upon said tub reaching a predetermined spinning speed.

5. A laundry machine comprising a tub rotatably mounted to spin about its vertical axis and having a fluid-tight side wall; means for spinning the tub; a foraminous wall within the tub spaced inwardly from said side wall in fixed relation thereto, thereby defining an annular chamber between the two walls; and means for discharging fluid from said chamber upon said tub reaching a predetermined spinning speed; said means comprising a fluid collecting channel below the tub floor and around its peripheral portion; a valve in said channel normally seating in the direction of fluid flow therepast; a weight mounted to travel with said tub; lever means interconnecting the weight and the valve, said weight being shiftable by centrifugal force whereby said valve may be lifted from its seat against fluid pressure thereover; and a fluid collecting trough fixed in position relative to said tub and in the path of the discharge of said valve.

6. A laundry machine comprising a vessel for containing liquid and fabrics to be washed rinsed, and damp-dried therein; a liquid receiving chamber around the periphery of and carried by the vessel; a foraminous wall between the vessel and said chamber fixed in relation thereto and serving to retain said fabrics within the vessel and permit passage of liquids from the vessel to said chamber; said vessel being rotatably mounted on a vertical axis; a driving motor; driving mechanism between the motor and the vessel; means incorporated in said mechanism for selective unidirectional and oscillatory driving of the vessel; a centrifugally operable discharge valve normally seating in the direction of fluid flow therepast carried by said chamber and actuated to open position only upon said vessel reaching a predetermined speed of unidirectional spinning; weight means responsive to centrifugal force to open said valve in opposition to fluid pressures thereon; and means for controlling said mechanism.

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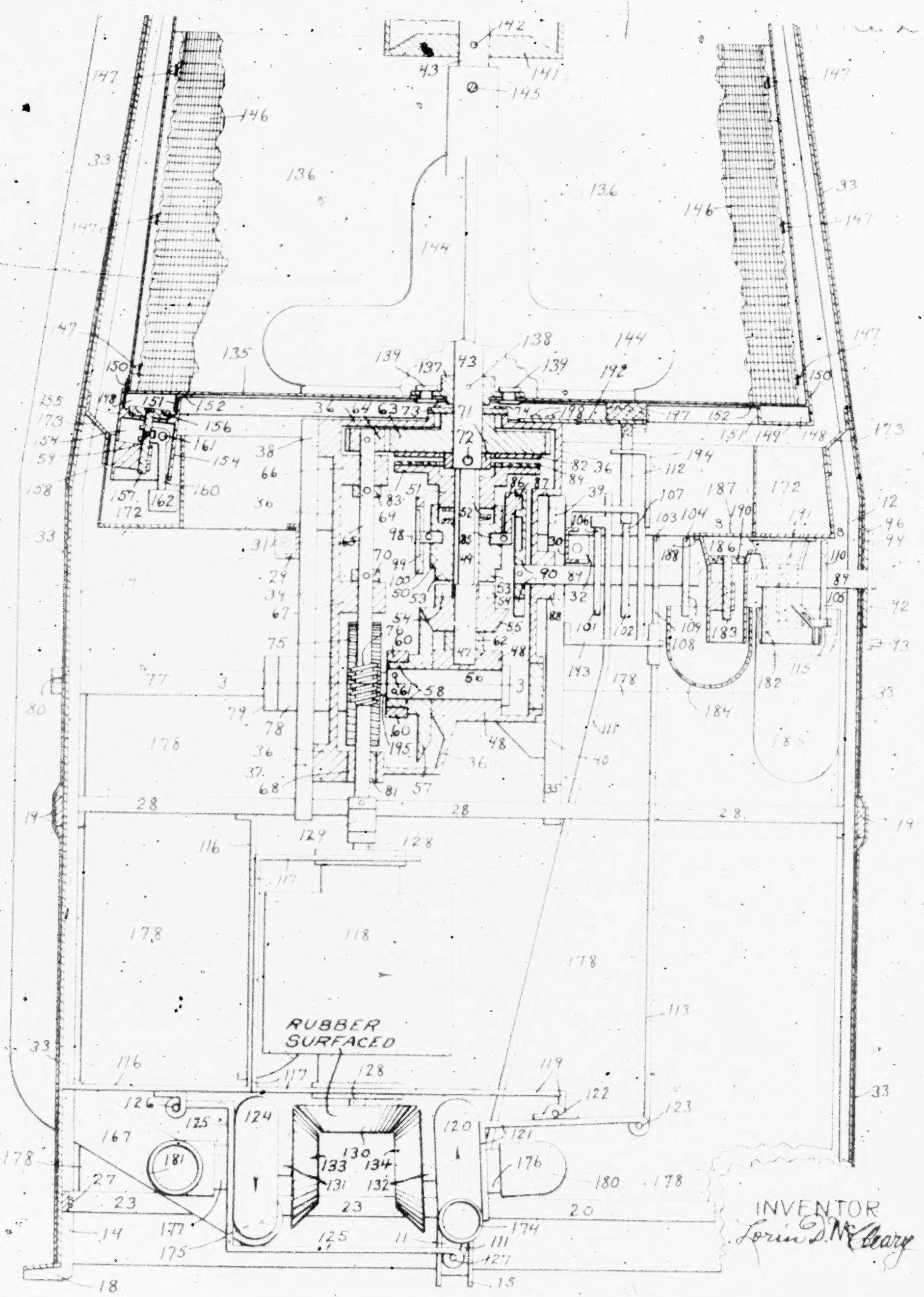
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APPARATUS FOR TREATING FIBROUS WASTE FOR JOURNAL BOX USE

Filed Jan. 9, 1934 2 Sheets-Sheet 1

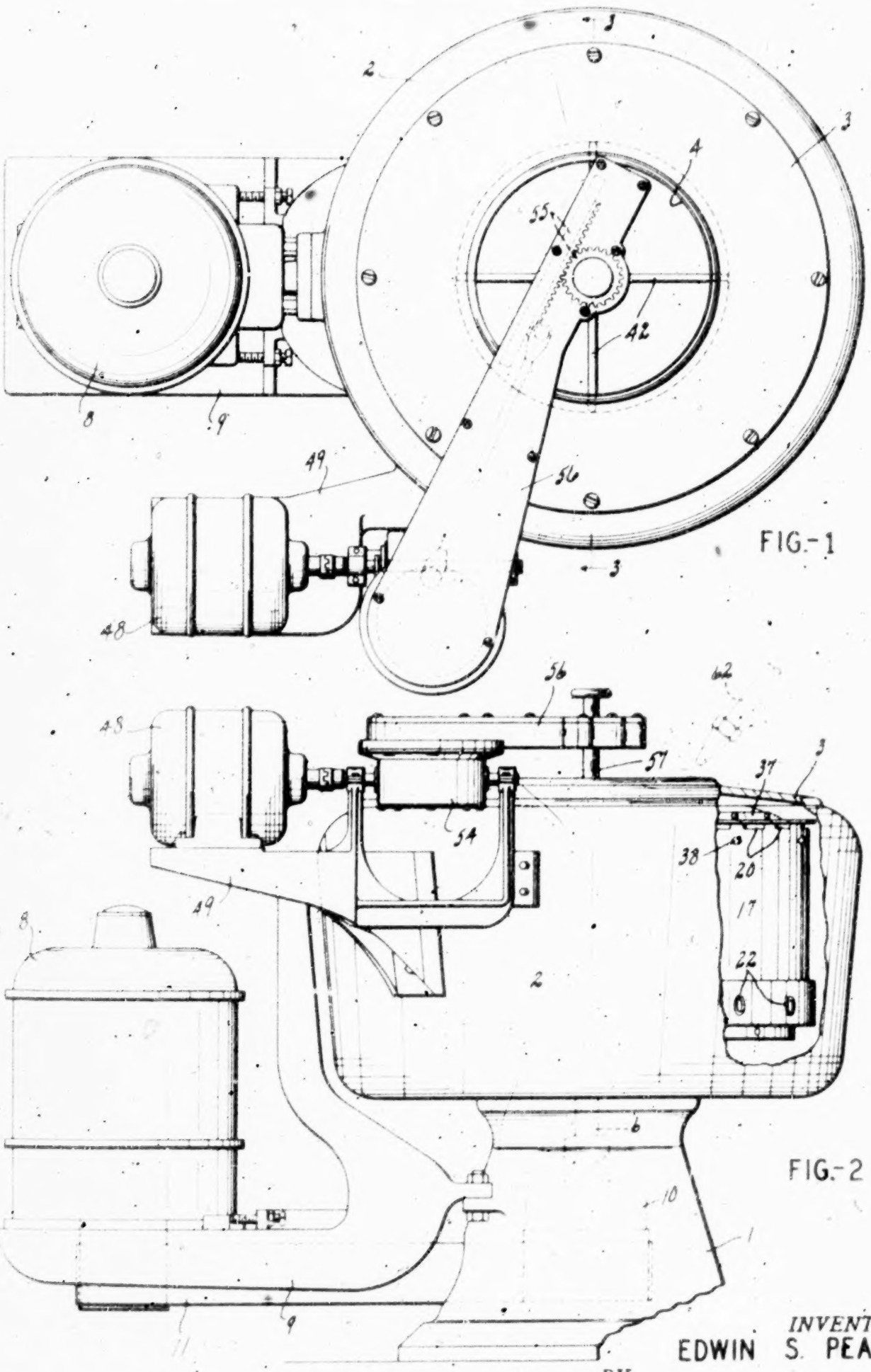

FIG.-1

FIG.-2

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APPARATUS FOR TREATING FIBROUS WASTE FOR JOURNAL BOX USE

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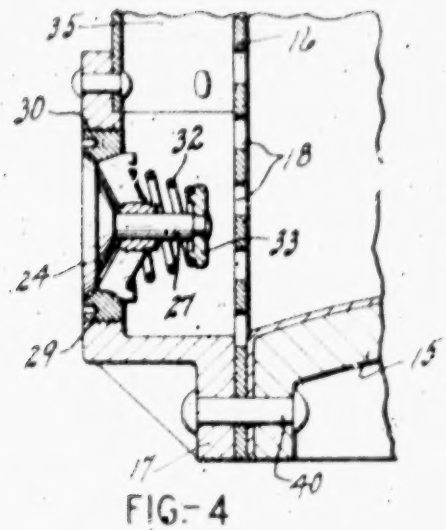

FIG.-4

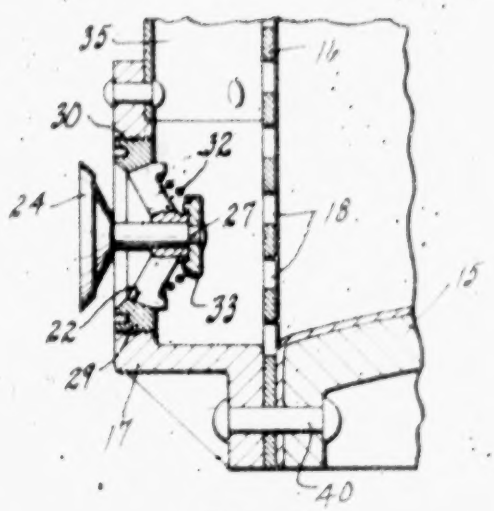

FIG.-5

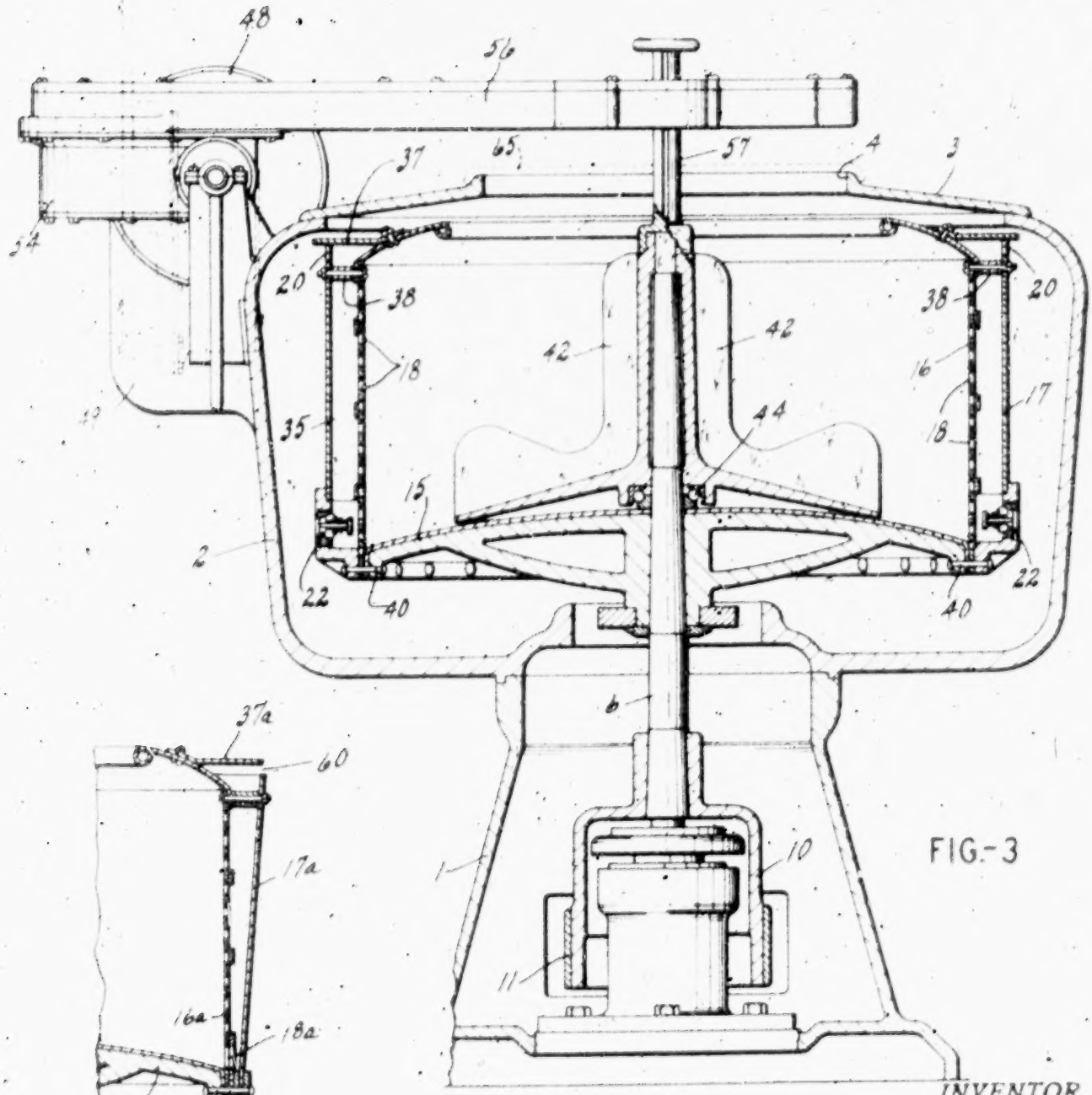

FIG.-3

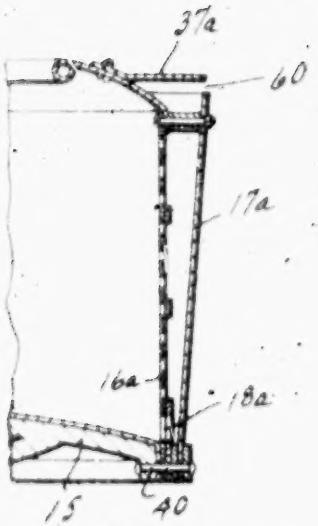

FIG.-6

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UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATING FIBROUS WASTE FOR JOURNAL BOX USE

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7 Claims. (Cl. 68—23)

This invention relates to apparatus for treating fibrous waste for journal box use, the present invention relating to the treatment of both new waste not before supplied with journal oil and old waste containing more or less dirty journal oil.

As pointed out in one or more of my prior patents for subject matter of this general character, particularly in my Reissue Patent No. 18,599 granted September 13, 1932, new waste normally contains, as the result of its manufacture, more or less lint, and unless such lint is removed, the effectiveness of the waste as a carrier for journal oil is materially reduced. Likewise, old waste contains more or less lint as the result of its use in journal boxes, and the removal of such lint, as well as the removal of dirt, moisture, bits of metal, etc., which old waste normally contains after use thereof, is quite essential if the reclamation of the waste is to be complete.

It is therefore the general object of the present invention to provide an improved apparatus for treating fibrous waste, both new waste and old waste, to effectively and efficiently remove therefrom all of the objectionable content thereof and to otherwise treat and condition such waste for subsequent journal box use.

A further object of the present invention is the provision of improved waste treating apparatus in the form of a single simple and inexpensive machine, with which are performed all of the steps of the present improved waste treating method, said method requiring for its performance a minimum handling of the waste and minimum amounts of time and labor.

Further and more detailed objects of the present invention are in part obvious and in part will appear more in detail hereinafter.

The invention will be readily understood from the following description thereof, reference being had to the accompanying drawings in which

Fig. 1 is a top plan view of the present improved waste treating apparatus, by the sole use of which the present improved method is performed; Fig. 2 is a side elevation of said apparatus, part of the curb or casing thereof being broken away to show the waste-receiving basket or container therein; Fig. 3 is a vertical sectional view of such apparatus, the view being on the line 3—3 of Fig. 1; Fig. 4 is an enlarged detail vertical sectional view of one of the valve-controlled liquid discharge ports of the waste-receiving basket or container of the present apparatus, said port being in closed condition; Fig. 5 is a similar view of such port in open condition; and Fig. 6 is a detail vertical sectional view of a portion of a slightly modified form of waste-receiving basket or container.

The present improved waste treating apparatus is generally similar to the waste treating apparatus of my aforesaid reissue patent, both pieces of apparatus being more or less modified forms of a rather well known type of centrifugal extractor.

As will be readily observed in the accompanying drawings, the present apparatus has a specially constructed waste-receiving basket or container, of such character that when said container is stationary a treating liquid, such as hot journal oil, may be readily held or contained therein. Upon rotation of said container, however, an appreciable portion of said liquid is discharged therefrom, said liquid carrying away with it all of the objectionable content of said waste which has been transferred thereto. To effect a most intimate contact of said waste and said treating liquid, to thereby transfer to said liquid all or substantially all of the objectionable content of said waste, said container is provided with suitable agitating means, operation of which only occurs when said container is stationary and hence in condition to hold the treating liquid supplied thereto.

In practicing the present improved method, the waste to be treated and a treating liquid, such as hot journal oil, are placed in the rotatable basket or container of the present apparatus, said basket or container being in a stationary and hence liquid-holding condition. The ingress of the waste and the treating liquid into the basket or container may occur simultaneously, or the ingress of one may precede the other, it usually being more convenient to supply the container with the treating liquid after the waste has been placed therein. After the waste and the treating liquid have been placed in the container, and while said container is yet stationary, the agitating means is operated, the result of which is to open up the fibres of the waste and effect a most intimate contact or intermingling of the treating liquid therewtih. The objectionable content of the waste, including its lint, cinders, dirt, etc., is more or less completely transferred to said liquid, and after sufficient time has elapsed for such a condition to be brought about, operation of the agitating means is terminated and rotation of said container is initiated, the latter operation effecting the removal from the waste in said container of an appreciable portion of said liquid and hence

of the objectionable content of the waste transferred thereto.

If desired, said oil treating and oil removing steps may be repeated, any subsequent treating steps in the reclamation of old waste being performed preferably with cleaner oil than that originally used. By so doing, the dirty oil of the oil films surrounding the individual waste fibres can be replaced with cleaner oil, the desirability of which is pointed out in my prior Patent No. 1,877,754, granted September 13, 1932. After the waste has been freed of its lint and other objectionable content, and while it is yet in the container of the present improved apparatus, it may be subjected to another agitating effect to again open up its fibres and to facilitate the vaporization of any moisture remaining therein, after which it may be supplied with a proper amount of journal oil and thus made ready for journal box use.

Referring now in detail to the present improved waste treating apparatus, 1 represents the base thereof and 2 a stationary curb or casing mounted thereon, the cover 3 of said curb or casing having a centrally disposed opening 4 for the reception of agitator operating means hereinafter described.

Suitably mounted in said base and extending upwardly into said curb or casing is a vertically disposed shaft 6, rotation of which is produced by any suitable power means. As here shown, an electric motor 8 is employed for effecting rotation of said shaft, said motor being mounted on a bracket 9 suitably secured to the base 1 and being operatively connected to a pulley 10 on the lower end of said shaft through the instrumentality of a belt 11.

Suitably mounted on said shaft 6, within the curb or casing 2, is a waste-receiving basket or container, said basket or container differing from the usual centrifugal extractor basket or container chiefly because of the additional peripheral wall with which it is provided.

In the embodiment of the invention shown in Figs. 1 to 5 inclusive, the waste-receiving basket or container is provided with a suitable imperforated bottom wall 15, as is usual, and a pair of spaced peripheral walls 16, 17, the inner wall 16 being provided throughout substantially its entire area with relatively small, closely spaced apertures 18 and the outer wall 17 being provided with perforations only at its upper and lower ends. At its upper end, said outer wall is provided with a circumferentially disposed series of notches 20, and at its lower end, said wall is provided with a circumferentially disposed series of ports 22.

When the basket or container is stationary, and such is its condition during loading and unloading thereof and during operation of the hereinafter described agitating means, the ports 22 are closed by spring pressed valves 24, as shown in Fig. 4, at which times said basket or container is capable of holding or containing a treating liquid, such as hot journal oil, up to the level of the notches 20. Upon rotation of said basket or container, however, and such rotation is effected when it is desired to remove therefrom the treating liquid supplied thereto, the valves 24 controlling said ports are thrown outward by centrifugal force, as in Fig. 5, with consequent opening of said ports and ejection from said basket or container of at least the major portion of said treating liquid.

As best shown in Figs. 4 and 5, the stem 27 of each valve 24 extends through a ported disc 28 threaded or otherwise suitably secured in an opening 30 in the outer wall 17 of said basket or container, said valve being normally held inwardly, in closing position relative to the ports 22 of said disc, by a coiled spring 32 surrounding said valve stem and bearing against said disc and a collar 33 with which the inner end of said stem is provided. The amount of centrifugal force necessary to effect opening of these valves 24 is regulated by the compressive strength of the springs 32, the strength thereof being preferably sufficient to effect closing of said valves against a hydrostatic head of hot journal oil of a depth substantially equal to that of said basket or container. Any desired number of these valve controlled liquid discharge ports may be employed in the basket outer wall 17, twenty-four such ports having been found to be quite satisfactory for a basket or container having a diameter of twenty-eight inches or so.

In order to prevent treating liquid in the annular space 35 between the inner and outer peripheral walls 16, 17 of said basket or container from being thrown upwardly out of said space, upon rotation of said basket or container, the inner wall 16 thereof is provided with a suitable imperforate cover plate 37 for said space, the inner edge portion of said cover plate being bolted or otherwise suitably secured to said inner wall and the outer edge portion of said cover plate overlying and resting upon the upper edge of said outer wall. Because of this cover plate, any liquid leaving the basket or container, as the result of rotation thereof, must do so through the notches 20 or the valve controlled ports 22.

To insure proper spaced relation of the upper portions of said inner and outer basket walls 16, 17, said portions are suitably interconnected at 38 in such relation, and to economically secure the desired rigidity for said inner wall, suitable reenforcing bands are provided therefor, as shown. As is usual, the bottom wall 15 of said basket or container is suitably secured to the shaft 6 for rotation therewith, said bottom wall having riveted or otherwise suitably secured thereto, as at 40, the lower ends of said basket side walls 16, 17.

Suitably mounted in said basket or container, for oscillatory movement about the shaft 6 as a center, is a multi-bladed agitator 42, the primary function of which is to effect a more intimate contact or interningling of the treating liquid with the waste being treated. Preferably and as shown, a ball-bearing support 44 or the like is provided for said agitator to facilitate oscillatory movement thereof, such movement being effected by any suitable power means.

In the embodiment of the invention here illustrated, an electric motor 48 is employed for effecting oscillatory movement of said agitator, said motor being mounted on a curb or casing bracket 49 and being operatively connectible to said agitator by any suitable means. Such a means may include suitable speed reducing mechanism, such mechanism (not shown) being contained in the housing 54 of the present apparatus, crank-operated rack and pinion mechanism 55 contained in a suitable housing 56, and a socket shaft 57 carried by said housing 56 and adapted for operative connection with the upper end of the agitator 42.

During operation of said agitator, the crank motion housing 56 has a horizontally disposed position overlying the curb or casing 2 and the

waste-receiving basket or container therein, as shown in full lines in Figs. 1, 2, and 3, the socket shaft 57 carried by said housing being detachably connected to said agitator. When operation of said agitator is not desired, the crank motion housing 56 and the socket shaft 57 carried thereby are swung upwardly to an inoperative, out-of-the-way position, as shown in dotted lines, Fig. 3, in which position loading and unloading of the basket or container are not hampered or otherwise interfered with.

In Fig. 6, a slightly modified form of waste-receiving basket or container is shown, said basket or container differing from the basket or container of Figs. 1 to 5 inclusive only in the construction of its peripheral walls 16*a*, 17*a*. As shown, the inner wall 16*a* of the basket or container of Fig. 6 is provided at its lower end with a circumferentially disposed series of enlarged liquid discharge apertures 18*a*, of slot-like or other suitable form, and the outer wall 17*a* of said basket or container is of imperforate character throughout.

To effect the desired discharge of treating liquid from this modified form of basket or container, upon rotation thereof, the outer imperforate wall 17*a* thereof is of upwardly and outwardly flared form, the upper edge thereof being spaced from the cover plate 37*a* to provide therebetween an annular passageway 60 for the discharge of said treating liquid.

In carrying out the present improved method of treating or conditioning waste, the waste to be treated or conditioned and a treating or conditioning liquid, such as hot journal oil, are placed in the basket or container of the present improved apparatus, the entry of the oil thereinto being effected by the use of a suitable supply hose 62 or the like, Fig. 2. Preferably, the waste is placed in said basket or container first, and then the oil is added, the space remaining in the basket or container after the waste is placed therein being preferably filled with oil. During this loading operation, the basket or container is stationary, so that if its outer peripheral wall is provided with valve-controlled discharge ports, such as the ports 22 of Figs. 1 to 5 inclusive, said ports will be closed.

The addition of such hot oil to the waste materially increases the fluidity of any oil which the waste contains (and used waste contains more or less dirty oil in a more or less viscous state) and also effects vaporization of at least an appreciable portion of any moisture which the waste may contain. A further result of the addition of such hot oil is to transfer to said oil an appreciable portion of the lint which both new and old waste normally contain and an appreciable portion of the dirt, cinders, bits of metal, etc., which old waste always contains as the result of its use in journal boxes. Inasmuch as the annular space 35 between the container side walls 16, 17 is filled with oil, the outer side wall portions of the mass of waste within said container is subjected to the treating effects of said oil, as will be readily understood.

The next step in the treatment or conditioning of the waste is to operatively connect the motor 48 to the agitator 42, the operation of said agitator effecting a most intimate contact or intermingling of the treating oil with the waste and resulting in a more or less complete transfer to said oil of all of the objectionable content of said waste.

The next step in the treatment or conditioning of the waste is the removal therefrom of as much of said treating oil as possible, a result accomplished by rotating said basket or container at a relatively high speed. All objectionable content of the waste transferred to the oil leaves said container therewith, said oil leaving the container of Figs. 1 to 5 inclusive through the notches 20 and the now open ports 22 and leaving the container of Fig. 6 by flowing upwardly over the upper end of the outer imperforate wall 17*a* thereof. From the curb or casing 2, the discharged oil, with the objectionable content of the waste transferred thereto, flows through a suitable discharge conduit (not shown) to a suitable reservoir, oil reclamation plant or to any other device or apparatus, as desired. During the oil removing operation, the curb or casing 2 is preferably provided with a suitable cover 65, such as shown in dotted lines, Fig. 3.

If desired and as will be readily understood, the above steps may be repeated, the advisability of so doing depending upon the condition of the waste being treated. In the treatment of old waste, any subsequent oil washing steps should be performed, preferably, with cleaner oil than that originally used, to thereby replace the oil of the oil films surrounding the individual waste fibres with cleaner oil. As pointed out in my aforesaid Patent No. 1,877,754, said oil films cannot be removed by an extracting operation but, by the use of a method such as here described, the oil of said films can be replaced by other and cleaner oil.

Either before or after the treatment of the waste with oil, in the manner here set forth, said waste may be treated with other fluids, although such other treatment is usually not necessary, so effective is the present method.

After removal of the treating oil and the objectionable content of the waste transferred thereto, and while said waste is yet in the container of the present apparatus, a proper amount of lubricating oil may be added to said waste, thereby making it ready for journal box use.

Further features and advantages of the present improved apparatus and the present improved method will be apparent to those skilled in the art to which it relates.

What I claim is:

1. Apparatus of the character described, comprising a stationary casing, a work-receiving basket structure rotatably mounted therein, said basket structure having spaced peripheral walls, the outer one of which is provided with a plurality of apertures, closures for said apertures slidably mounted on said outer peripheral wall, and spring means for normally maintaining said closures in closing position relative to said apertures, said spring means lying in the space between the peripheral walls of said basket structure.

2. Apparatus of the character described, comprising a stationary casing having a work-receiving basket structure rotatably mounted therein, said basket structure having spaced peripheral walls, the outer one of which is of upwardly and outwardly flaring imperforate form and the inner one of which is of perforate form, with a series of perforations of larger cross-dimensions than the perforations thereabove adjacent the lower end thereof.

3. Apparatus of the character described, comprising a stationary casing, and a work-receiving basket structure rotatably mounted therein, said basket structure having spaced peripheral walls, the inner one of which is provided adjacent its

lower end with generally vertically extending, circumferentially disposed elongated apertures and being provided above said elongated apertures with relatively closely spaced apertures of reduced cross-dimensions.

4. Apparatus for treating fibrous waste for journal box use, comprising a stationary casing, a rotatable shaft in said casing, a work-receiving basket structure arranged within said casing and mounted on said shaft for rotation therewith, said basket structure having spaced peripheral walls, the outer one of which is constructed and arranged to retain oil when stationary and the inner one of which is of perforate form, said outer peripheral wall being arranged for discharge of oil therefrom when in rotation, agitating means arranged in said basket structure for rotary movement about said shaft and on which agitating means work may be placed, means for effecting rotary movement of said agitating means about said shaft, and means for rotating said shaft and hence said basket structure.

5. Apparatus of the character described, comprising a stationary casing, a work-receiving basket structure rotatably mounted therein, agitating means arranged in said basket structure and on which work may be placed, means for operating said agitating means, and motor means for rotating said basket structure, said operating means for said agitating means including a motor and operative connections between said motor and said agitating means, said last named motor having a stationary mounting and said operative connections being movable between a generally horizontally disposed operative position and a generally vertically disposed inoperative position.

6. Apparatus of the character described, comprising a stationary casing, a shaft rotatable in said casing, a work-receiving basket structure arranged within said casing and mounted on said shaft for rotation therewith, agitating means arranged within said basket structure for rotary movement about said shaft, motor means for rotating said shaft and hence said basket structure, and means for operating said agitating means, said operating means including a motor and connecting means for operatively connecting said motor and said agitating means, said connecting means including rack and pinion mechanism and a socket driving shaft and being movable between an operative position over said basket structure and an inoperative position at one side of said basket structure.

7. Apparatus for treating fibrous waste for journal box use, comprising a stationary casing, a rotatable shaft in said casing, a work-receiving basket structure arranged within said casing and mounted on said shaft for rotation therewith, said basket structure having spaced peripheral walls, the inner one of which is of cylindrical form and of perforate character and the outer one of which is of upwardly and outwardly flaring form and of imperforate character, agitating means arranged in said basket structure for rotary movement about said shaft and on which agitating means work may be placed, means for effecting rotary movement of said agitating means about said shaft, and means for rotating said shaft and hence said basket structure.

EDWIN S. PEARCE.

CERTIFICATE OF CORRECTION.

Patent No. 2,106,986. February 1, 1938.

EDWIN S. PEARCE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, lines 68 and 69, claim 2, strike out the words "of larger cross-dimensions than the perforations thereabove" and insert the same after "thereof" and before the period in line 70, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of March, A. D. 1938.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)

Nov. 27, 1923. **1,475,323**

A. SCHMÜCKING

CENTRIFUGAL DRUM

Filed March 16, 1923

Fig. 1.

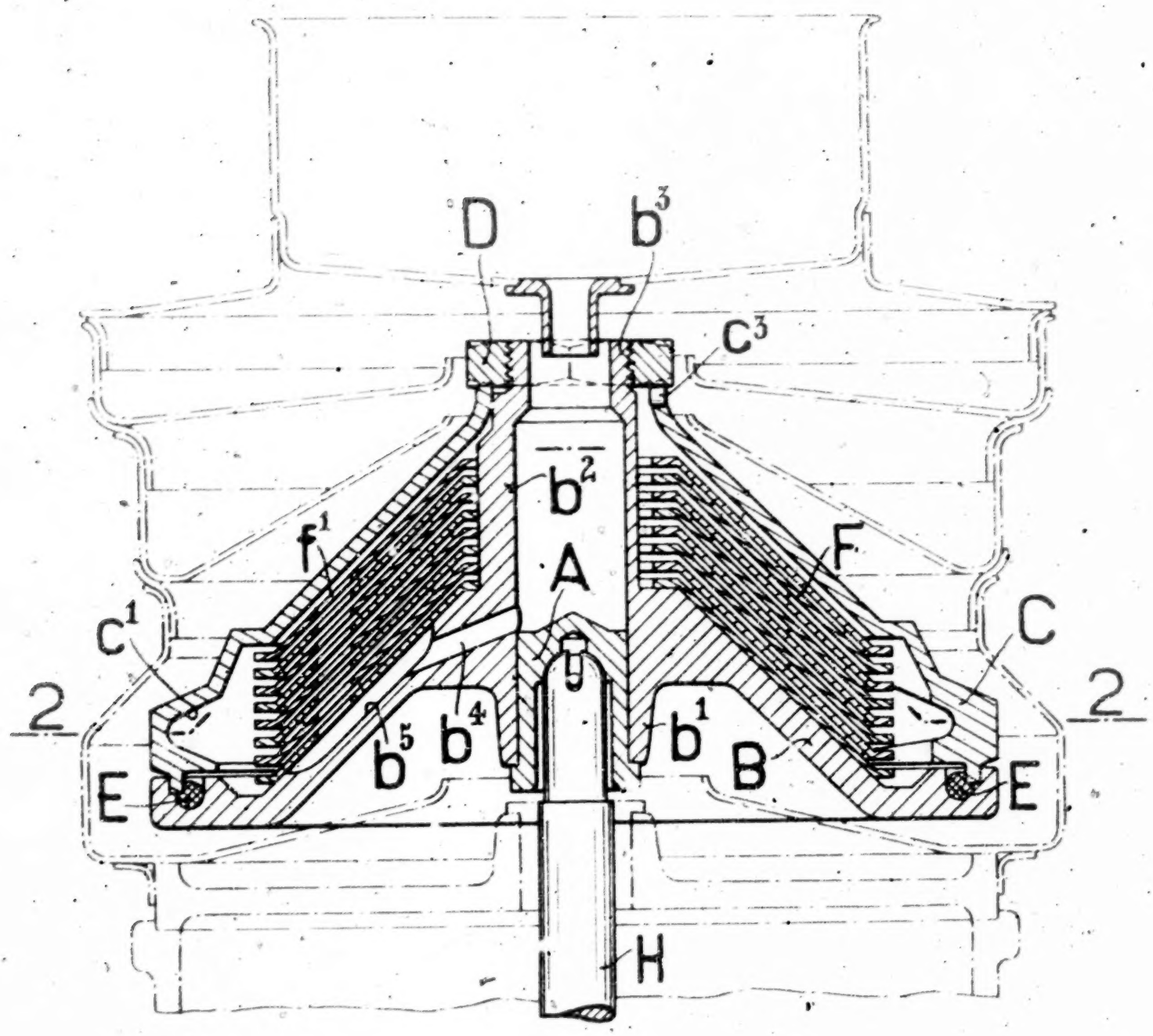
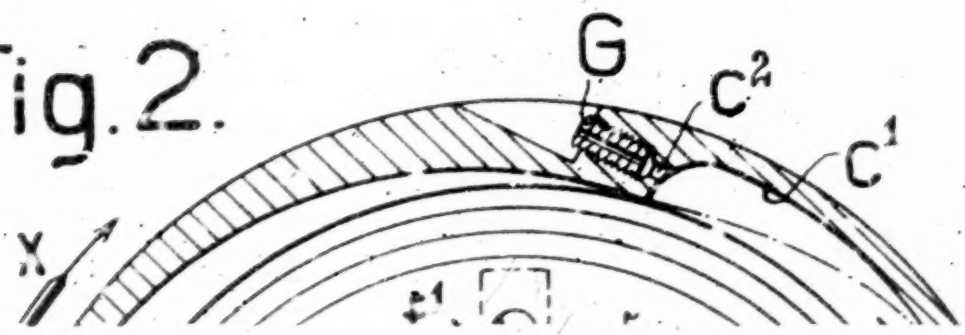


Fig. 2.



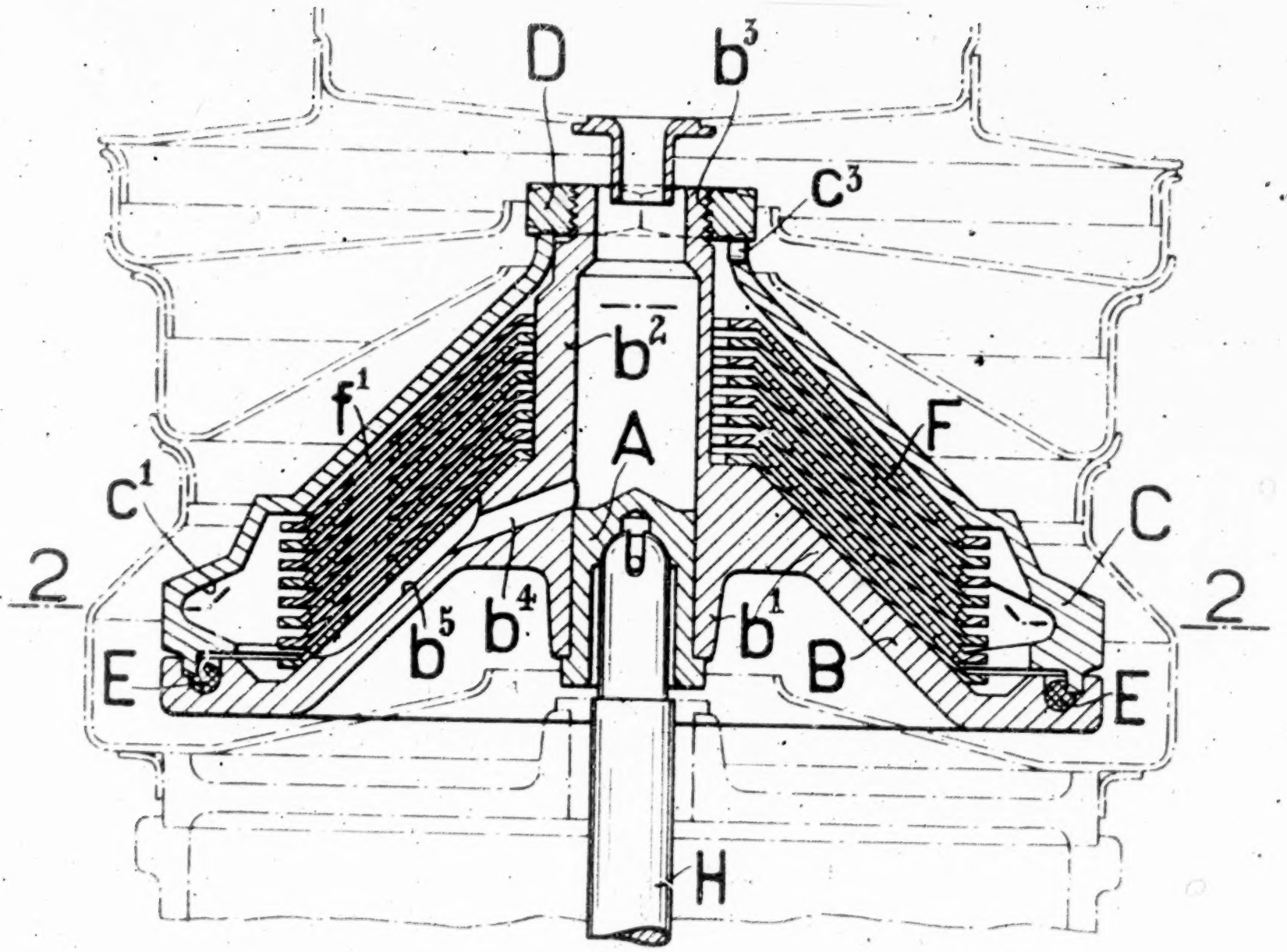
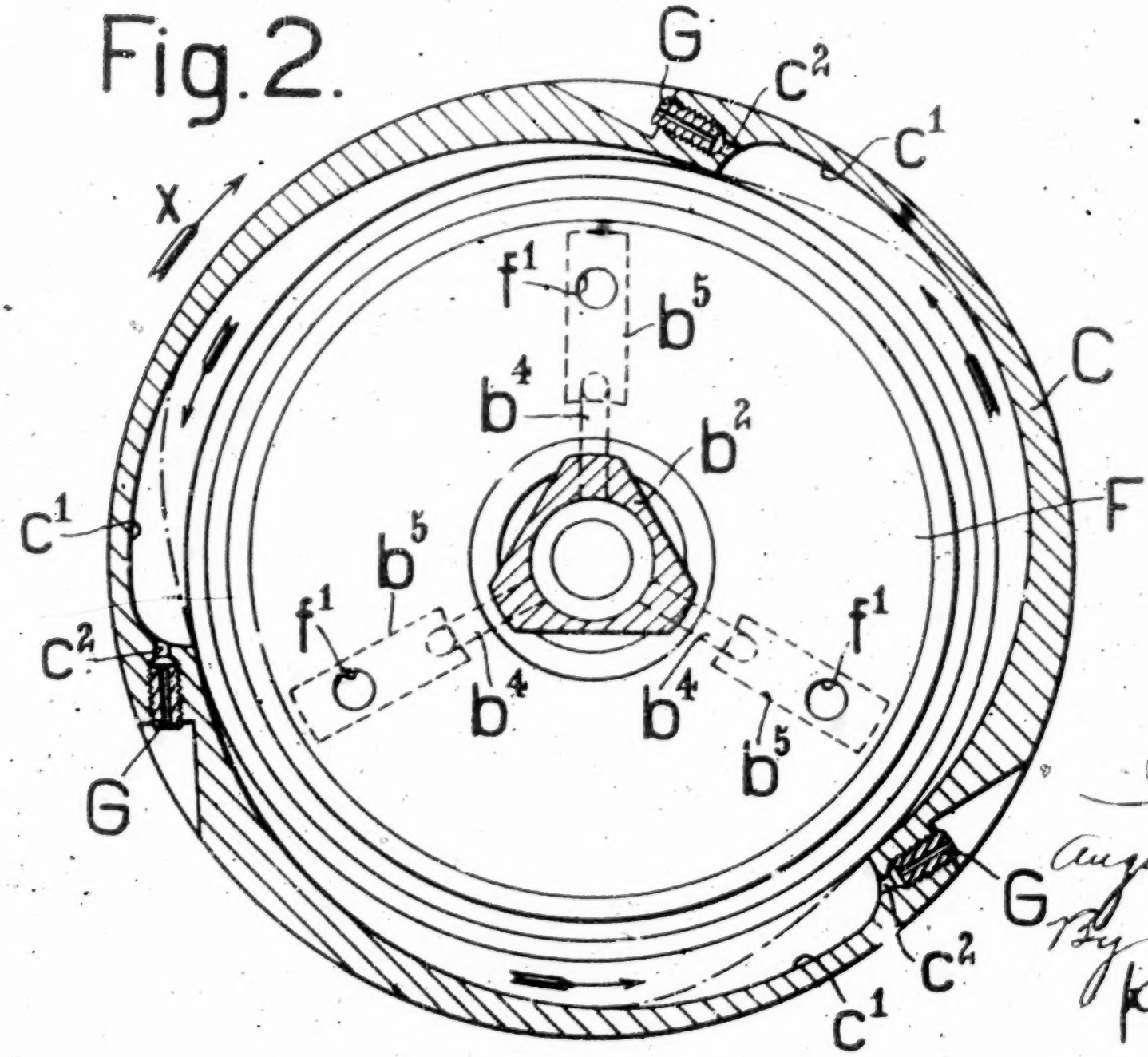


Fig.2.



Inventor:
August Schmücking
By
Kirchhoff & Co
Attys

Patented Nov. 27, 1923. 1,475,323

UNITED STATES PATENT OFFICE.

AUGUST SCHMÜCKING, OF ESSEN, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIEN-GESELLSCHAFT, OF ESSEN-ON-THE-RUHR, GERMANY.

CENTRIFUGAL DRUM.

Application filed March 16, 1923. Serial No. 625,543.

To all whom it may concern:

Be it known that I, AUGUST SCHMÜCKING, residing at Essen, Germany, a citizen of the German Republic, have invented a certain new and useful Improvement in Centrifugal Drums, of which the following is a specification.

The invention relates to centrifugal drums which are designed for clarifying liquids and are provided with outlet openings at their circumference serving for delivering the separated constitutents of the liquid. The invention has for its object to so improve centrifugal drums of the character stated that a particularly efficient clarification of the liquid is attained without remarkable losses in liquid.

The drawing illustrates by way of example an embodiment of the subject-matter of the invention, showing a centrifugal drum fitted with inserted separate filtering elements and designed for the clarification of lacs.

Fig. 1 being an axial section through the drum.

Fig. 2 being a section on the line 2—2 of Fig. 1, seen from above.

On a bearing sleeve A there is fixed the tubular projection b^1 of the drum base B. The latter extends upwardly so as to form, as the prolongation of the projection b^1, a sleeve b^2 the free end of which shows external screw threads b^3, and projects beyond the drum cap C. A nut D screwed on the threads b^3 firmly presses the drum cap C against the base B and a packing ring E interposed between the parts B and C. The hollow space of the sleeve b^2 is connected to the hollow space of the drum B C by three passages b^4 which are set at 120° with relation to each other. The passages b^4 open into radial grooves b^5 of the drum base B.

Within the drum B C are arranged, in a well known manner, disks F which form the clarifying filters. The disks F each show, at equal distance from their axis of rotation, three holes f^1 likewise set at 120° with relation to each other. When the drum is ready for use, the holes f^1 of all the disks F are situated above one another and above the grooves b^5. The latter are covered by the lowermost disk F. In the lower portion of the drum cap C which portion is the most distant from the drum axis, are provided three recesses c^1 the walls of which are eccentrically curved with relation to the drum axis. The drum cap C is further so shaped that its inner wall surface is inclined towards the said recesses c^1. A tangential boring c^2 each leads from the deepest portion of said recesses c^1 into an external recess, respectively, of the circumferential wall of the drum cap C, a nozzle G being screwed in each of said borings c^2. The upper portion, abutting against the nut D, of the cap C has borings c^3. The entire drum is detachably mounted, in a well-known manner, on a driving spindle H.

In the following the process of clarifying a lac liquid will be described in detail.

From the supply tank indicated by dash and dotted lines on the drawing the lac firstly enters the interior of the sleeve b^2 and from there, through the passages b^4, the grooves b^5 underneath the disks F. The lac will rise through the holes f^1 while at the same time its specifically heavier constituents, the mud, are hurled outwards, owing to centrifugal action, and led into the recesses c^1 by the downwardly inclined disks F. As the drum is rotating in the direction of arrow *x*, Fig. 2, the lac undergoes a relative movement in opposite direction owing to its inertia. In consequence of this relative movement the separated constituents will be washed towards the deepest portion of the recesses c^1, see the dash and dotted lines of Fig. 2. This is facilitated by the above-described shape of the walls of the drum cap C. The mud then leaves the drum through the nozzles G, a portion of the force spent for the acceleration of the lac liquid being won back by the jets of lac tangentially spouting out of the nozzles G in the direction opposite to the rotation of the drum. The clarified lac flows out through the borings c^3.

Claims:

1. In a centrifugal drum for clarifying liquids and having circumferential outlets for the separated constituents of the liquid, collecting recesses of increasing depth at the inside of the circumferential wall of the drum, said outlets being situated at the deepest portion of said recesses, and a nozzle in each outlet.

2. In a centrifugal drum for clarifying liquids and having circumferential outlets for the separated constituents of the liquid, collecting recesses of increasing depth

at the inside of the circumferential wall of the drum, said outlets being situated at the deepest portion of said recesses, and a tangentially extending nozzle in each outlet.

3. In a centrifugal drum for clarifying liquids and having circumferential outlets for the separated constituents of the liquid, collecting recesses of increasing depth at the inside of the circumferential wall of the drum, said outlets being situated at the deepest portion of said recesses, a tangentially extending nozzle in each outlet, and a tangentially extending recess on the outer circumferential wall surface of said drum in the prolongation of each nozzle.

The foregoing specification signed at Cologne, Germany, this 16th day of February, 1923.

AUGUST SCHMÜCKING.

April 14, 1942. C. G. SUITS ET AL 2,279,878

WASHING MACHINE

Filed Feb. 7, 1940

Fig 1

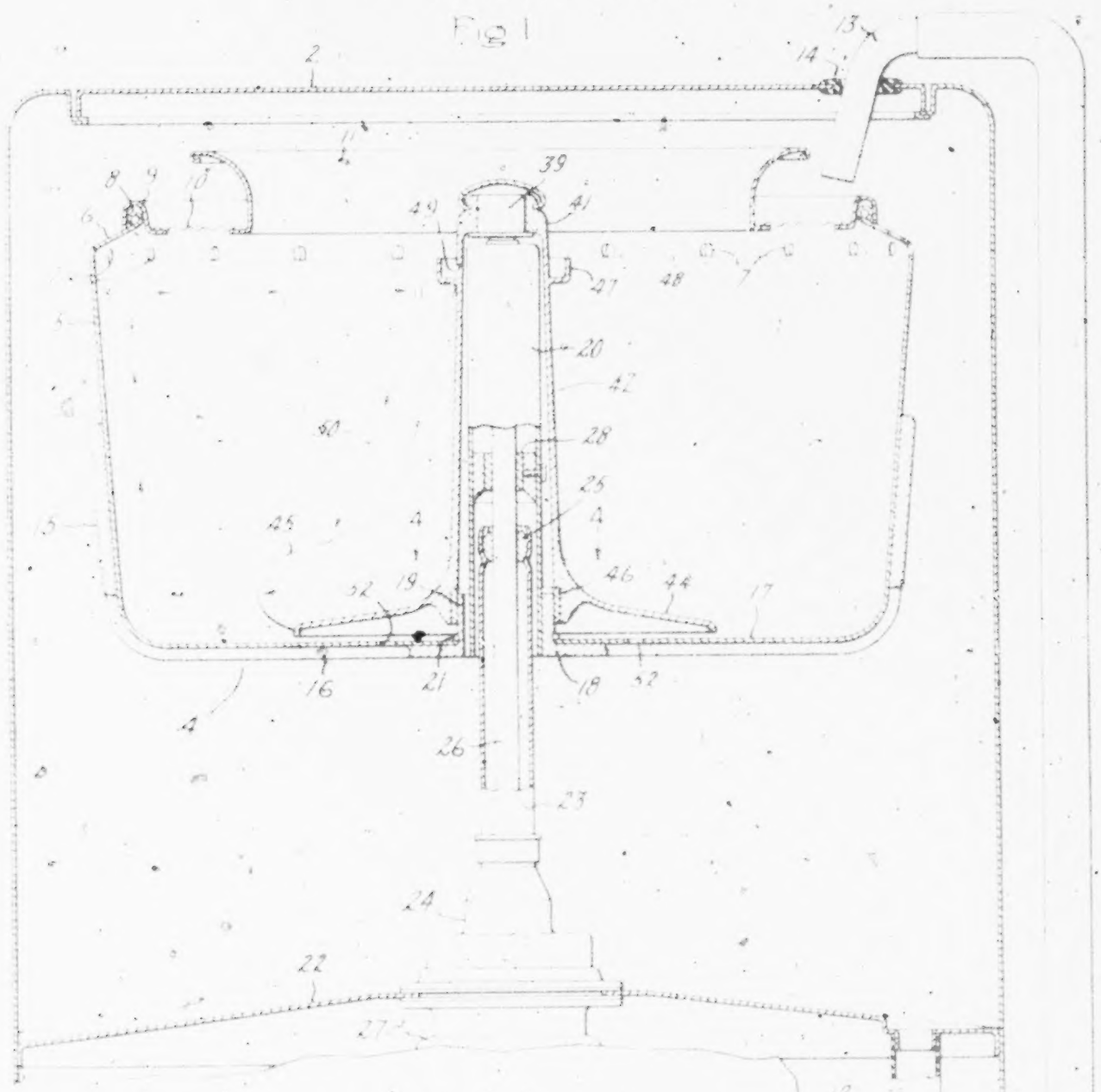


Fig 3

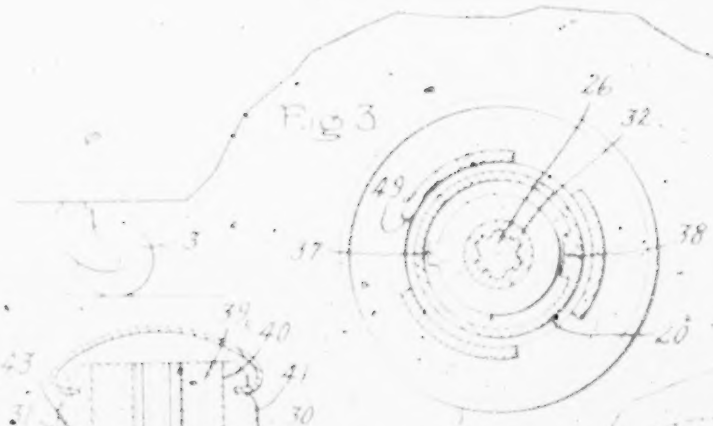


Fig 2

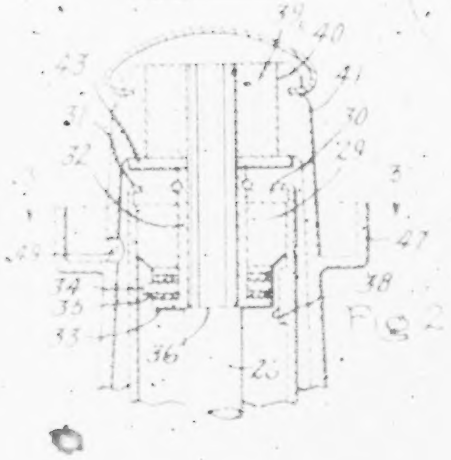
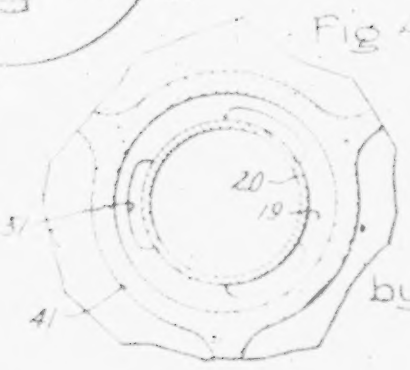


Fig 4



Inventors
Chauncey G. Suits,
Charles K. Skinner,
by Harry C. Dunham
Their Attorney

Plaintiff's Exhibit 11(n). 532

Patented Apr. 14, 1942 2,279,878

UNITED STATES PATENT OFFICE

2,279,878

WASHING MACHINE

Chauncey G. Suits, Schenectady, N. Y., and Charles K. Skinner, Southport, Conn., assignors to General Electric Company, a corporation of New York

Application February 7, 1940, Serial No. 317,715

2 Claims. (Cl. 68—23)

The present invention relates to washing machines of the type in which clothes are washed and centrifugally dried in a single receptacle or tub.

In such machines, during washing, a film of impurities, such as particles of lint and of the reaction products of soap, collects on the surface of the washing solution. When the receptacle is rotated for centrifugal drying, the clothes and liquid are thrown outward by centrifugal force against the side walls of the receptacle. The clothes collect in a layer on the side walls of the receptacle and the liquid is discharged over the edges of the receptacle or through discharge openings therein. The film tends to remain on the surface of the liquid and therefore collects on the inner surface of the clothes. This results in the deposit of a layer of impurities on the clothes.

The object of our invention is to provide an improved construction and arrangement in machines of this type for eliminating the above-described difficulties, and for a consideration of what we believe novel and our invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a sectional elevation of a washing machine embodying our invention; Fig. 2 is a sectional view of the upper end of the agitator; Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; and Fig. 4 is a sectional view taken on line 4—4 of Fig. 1.

Referring to the drawing, there is shown a washing machine having an outer casing or tub 1 provided with a cover 2 and supported by casters 3. In the upper part of the casing and above the water level therein is a rotatable tub or receptacle 4 for receiving the clothes to be washed. The receptacle 4 has outwardly and upwardly flaring side walls 5 which terminate at the upper edge in an inwardly extending rim 6. At the region of greatest diameter the side walls are provided with discharge openings 7 through which the liquid is centrifugally discharged during drying. On the inner edge 8 of the rim 6 is seated a ring 9 carrying an annular filter 10 of fabric or wire mesh screen. At the inner edge of the filter is a ring 11 flaring outward and upward therefrom to provide an opening through which clothes may be inserted and removed from the receptacle. During washing, liquid is pumped from the bottom of the outer casing 1 by means of a pump 12 and is discharged on to the filter 10 through a nozzle 13 extending through an opening 14 in the cover 2. In case the filter becomes clogged, the liquid overflows the upper edge of the ring 9 and runs down the outside of the receptacle to the casing. The filter therefore prevents the return of impurities to the receptacle.

The receptacle is supported in a carrier having annular side walls 15 surrounding the receptacle side walls 5 and having spaced radial arms 16 extending inward beneath the bottom walls 17 of the receptacle and secured at their inner ends to a disk 18. Integral with the disk 18 is an upwardly projecting cylindrical flange 19 in which is fixed a sleeve 20 which extends above the normal water level in the receptacle. The receptacle is removably fastened in the carrier by means of a snap ring 21 fitting in a groove in the flange 19 and clamping the bottom wall of the receptacle against the upper surface of the disk 18. The sleeve 20 therefore serves as the receptacle hub. The carrier has sufficient mass to serve as a balance weight for reducing the amplitude of vibration during centrifugal drying.

Extending upward from the bottom wall 22 of the outer casing 1 is a sleeve 23, the upper end of which is above the water level in the casing. The lower end of the sleeve is connected to the bottom wall of the casing by a liquid-tight joint 24. Journaled in a bearing 25 in the upper end of the sleeve 23 is a vertical shaft 26 which is selectively oscillated at washing speed or rotated at centrifugal drying speed by suitable mechanism located within a casing 27 supported below the bottom wall 22 of the outer casing. Suitable mechanism for this purpose being known in the art, illustration is not required. The upper end of the shaft 26 projects above the sleeve 23 and is journaled in the hub 20 of the receptacle carrier by means of a sleeve bearing 28 fixed to the inside of the hub 20 and by means of a combined sleeve and thrust bearing 29 secured in the upper end of the hub by means of a washer 30 fixed to the hub by a spun-over portion 31. From another aspect, the receptacle carrier is supported on the shaft and in rotatable relation thereto by the bearings 28 and 29. The bearing 29 is rotatable on a sleeve 32 splined on the upper end of the shaft 26. The lower end of the sleeve 32 is provided with an outwardly extending flange 33. Between the upper surface of the flange 33 and the lower end of the bearing 29 are arranged alternate disks 34 and 35 respectively of metal and of friction material. The weight of the receptacle and contents is transmitted from the hub 20 through the thrust washer 30 to the bearing 29 and from the bearing through the disks 34 and 35 and flange 33 to a shoulder 36 on the

shaft 26. The weight of the receptacle and contents therefore presses the disks 34 and 35 into frictional engagement. One of the metal disks 34 is provided with a projection 37 (Fig. 3) which cooperates with a projection 38 on the inner surface of the hub 20 to provide a driving connection between the shaft 26 and the hub 20 during continuous rotation of the shaft. During washing, when the shaft 26 is oscillated through an angle of the order of 200 degrees, the projection 37 does not strike the projection 38 and the receptacle accordingly remains substantially stationary. During centrifugal drying, when the shaft 26 is rotated, the projections engage and establish a friction drive for rotating the receptacle. The friction between the disks 34 and 35 prevents injury of the driving mechanism due to impact of the projections 37 and 38.

The splined upper end of the shaft 26 projects into an agitator drive nut 39 seated in a socket 40 in the upper end of the hub 41 of an agitator 42. The agitator is supported by a thrust washer 43 arranged between the lower edge of the agitator drive nut 39 and the upper edge of the sleeve 32. The agitator hub 41 depends around and is spaced from the hub 20 and terminates at its lower end in a disk 44 adjacent the receptacle bottom wall 17. Three vanes 45 extend radially from the agitator hub. The agitator hub is journaled at its lower end on the flange 19 by means of a bearing 46 fixed within the agitator hub.

Integral with the upper end of the agitator hub is an annular trough 47, the upper end of which is at or slightly below the water level in the receptacle indicated by the broken line 48. The trough communicates through passages 49 in the agitator hub with the space between the outside of the receptacle hub 20 and the inside of the agitator hub 41. During washing, the oscillation of the agitator causes the liquid to flow in radial circulatory paths indicated by the arrows 50 in Fig. 1. The circulation at the surface of the liquid in the receptacle is radially inward toward the trough 47. The surface liquid together with particles floating therein, such as lint and the soap reaction products, is therefore conducted to the trough 47 and flows into the trough through the passages 49 to the space between the receptacle and agitator hubs and down through vertical passages 51 in the flange 19 to the bottom of the outer casing 1. The close fit between the agitator bearing 46 and the flange 19 prevents the liquid within the agitator hub from flowing out beneath the agitator disk 44. The trough 47 is particularly effective in removing the impurities, due to its location at the center of the tub, and further due to the fact that the agitator, during washing operation, induces a circulation toward the trough. The particles floating on top of the washing solution are difficult to remove since they tend to collect in a film. The operation of the agitator produces a turbulence adjacent the trough 47 which tends to break up the film and thereby facilitates the flow of the particles into the trough. Although the discharge openings 7 are also arranged adjacent the liquid level in the receptacle, very few of the particles on the surface of the liquid flow out through the discharge openings 7. The radially inward circulation induced by the agitator and the cohesion of the particles in the film are sufficient to keep these particles from flowing out through the discharge openings 7. The surface liquid together with the particles formed thereon is continuously removed during the washing operation and conducted to the bottom of the outer casing 1. At the same time liquid is withdrawn from the bottom of the receptacle through openings 52 in the receptacle bottom wall 17. These openings are located beneath the disk 44 of the agitator hub 41. Heavy particles, such as sand, tend to flow out through these openings. Some of the liquid may splash out through the discharge openings 7 and collect in the bottom of the outer casing. All of the liquid collecting in the bottom of the outer casing during washing is continuously pumped on to the filter 10 by the pump 12. Here the solid particles are removed and only the clear filtered liquid is returned to the receptacle.

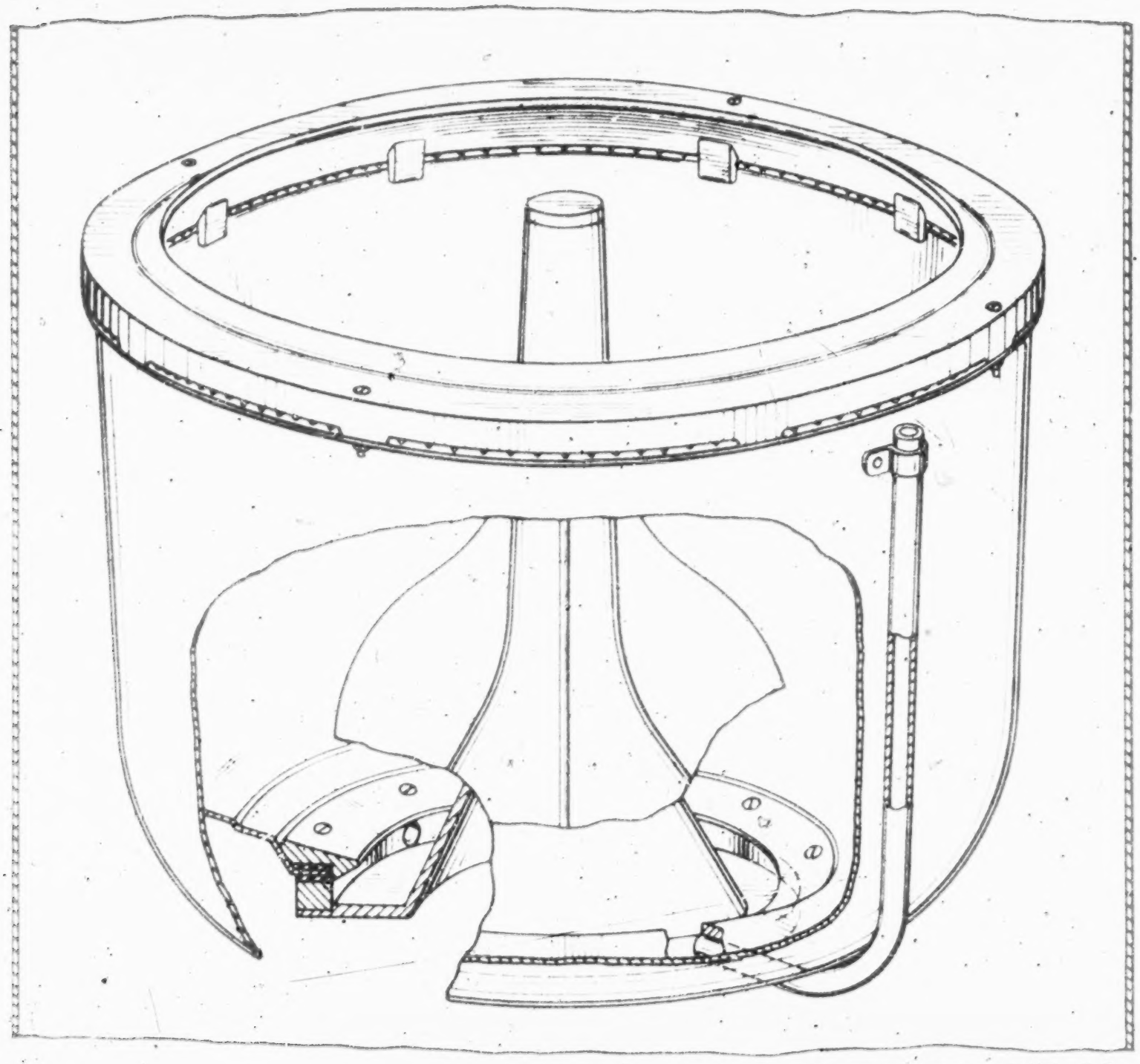
At the conclusion of the washing operation the clothes may be centrifugally dried, the liquid in the receptacle being caught and stored in the bottom of the outer casing, from which it may be returned to the receptacle for washing a succeeding load of clothes.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine, a clothes receptacle adapted to be filled with liquid to a predetermined level and having an upwardly extending hub at the center, an agitator having a body portion surrounding and spaced from said hub, said agitator having provisions for causing a circulation of the liquid radially toward the center of the receptacle at the surface of the liquid, a passage through the agitator body adjacent the surface of the liquid in the receptacle for conducting surface liquid and particles floating thereon to the space between the agitator body and said hub, a passage from said space for conducting said liquid and particles out of the receptacle, and means for removing said particles from said liquid and returning to the receptacle the liquid flowing through said passages.

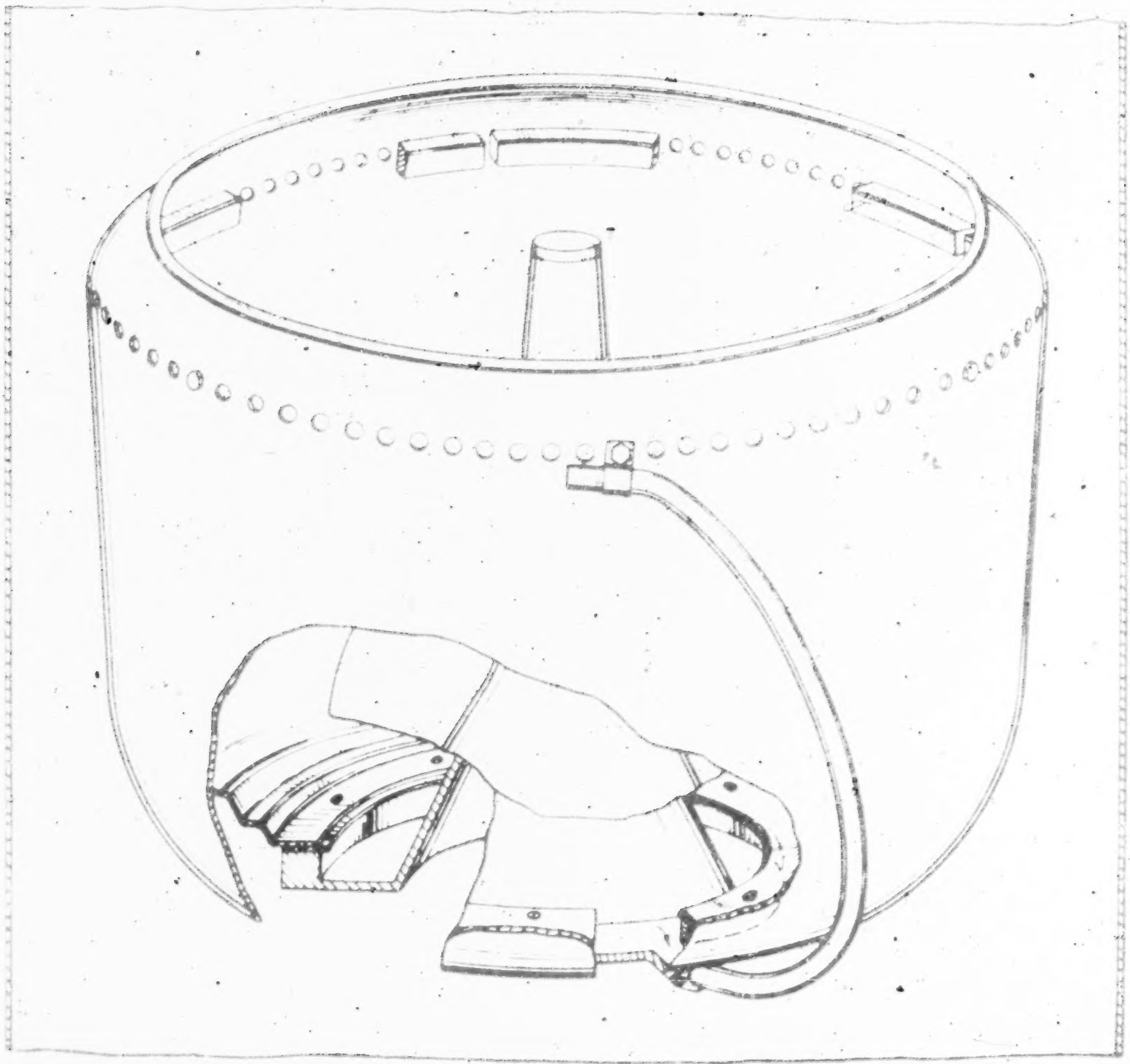
2. In a washing machine, an outer casing, a rotatable clothes receptacle adapted to be filled with liquid to a predetermined level, said receptacle being supported therein above the liquid level in the casing so as to drain to the casing and having a central upwardly extending hub therein, an agitator in the receptacle having a body portion surrounding and spaced from said hub, passages in the agitator body adjacent the surface of the liquid in the receptacle for conducting surface liquid and particles floating thereon to the space between the agitator body and said hub, a bearing for the agitator on said hub and below said passages, other passages extending through said bearing to below the bottom wall of the receptacle for draining said surface liquid to the casing, and means for returning said liquid from the casing to the receptacle.

CHAUNCEY G. SUITS.
CHARLES K. SKINNER.



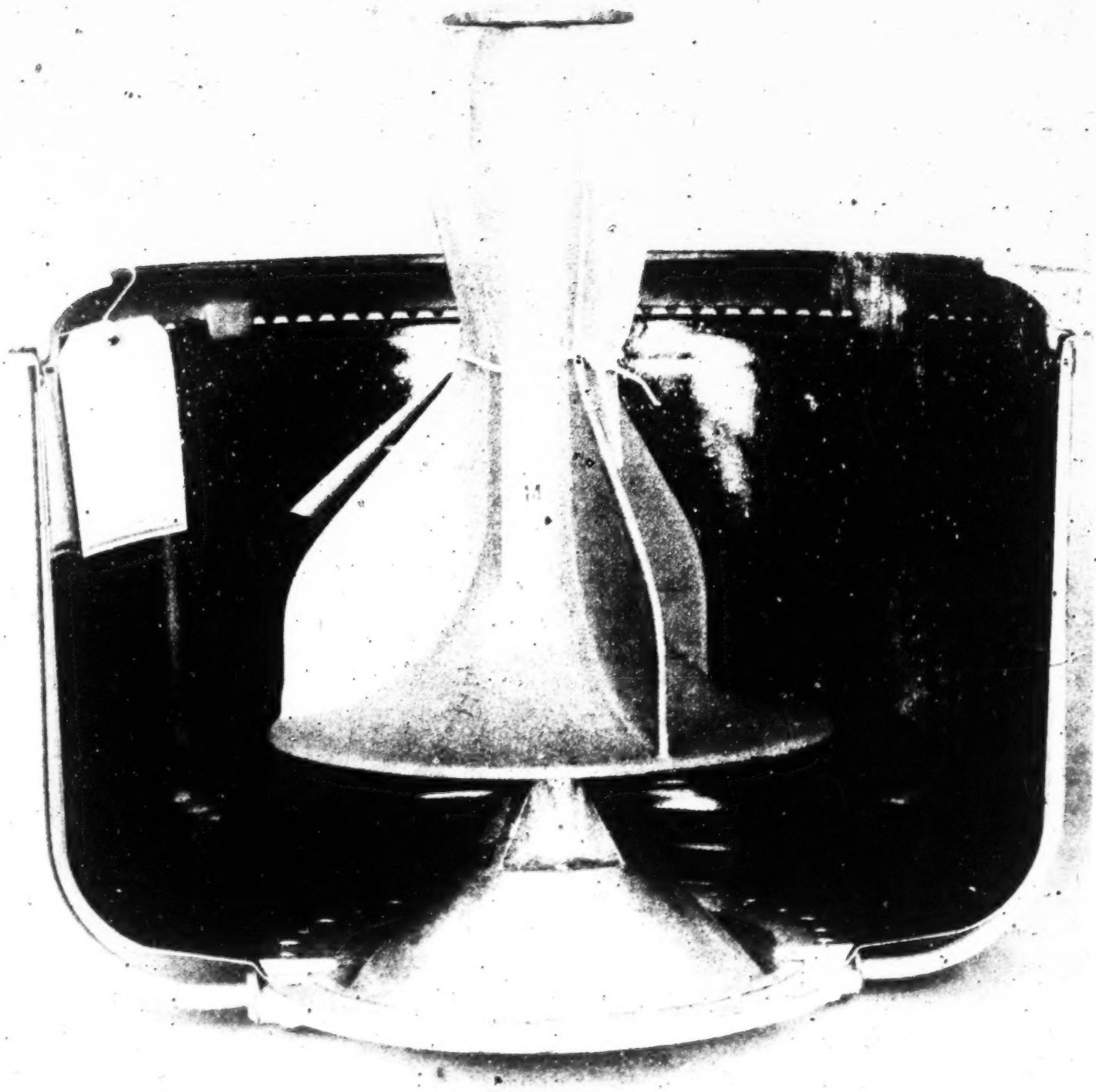
PLAINTIFF'S EXHIBIT 12

BEAM FIRST DESIGN



PLAINTIFF'S EXHIBIT 13

BEAM SECOND DESIGN



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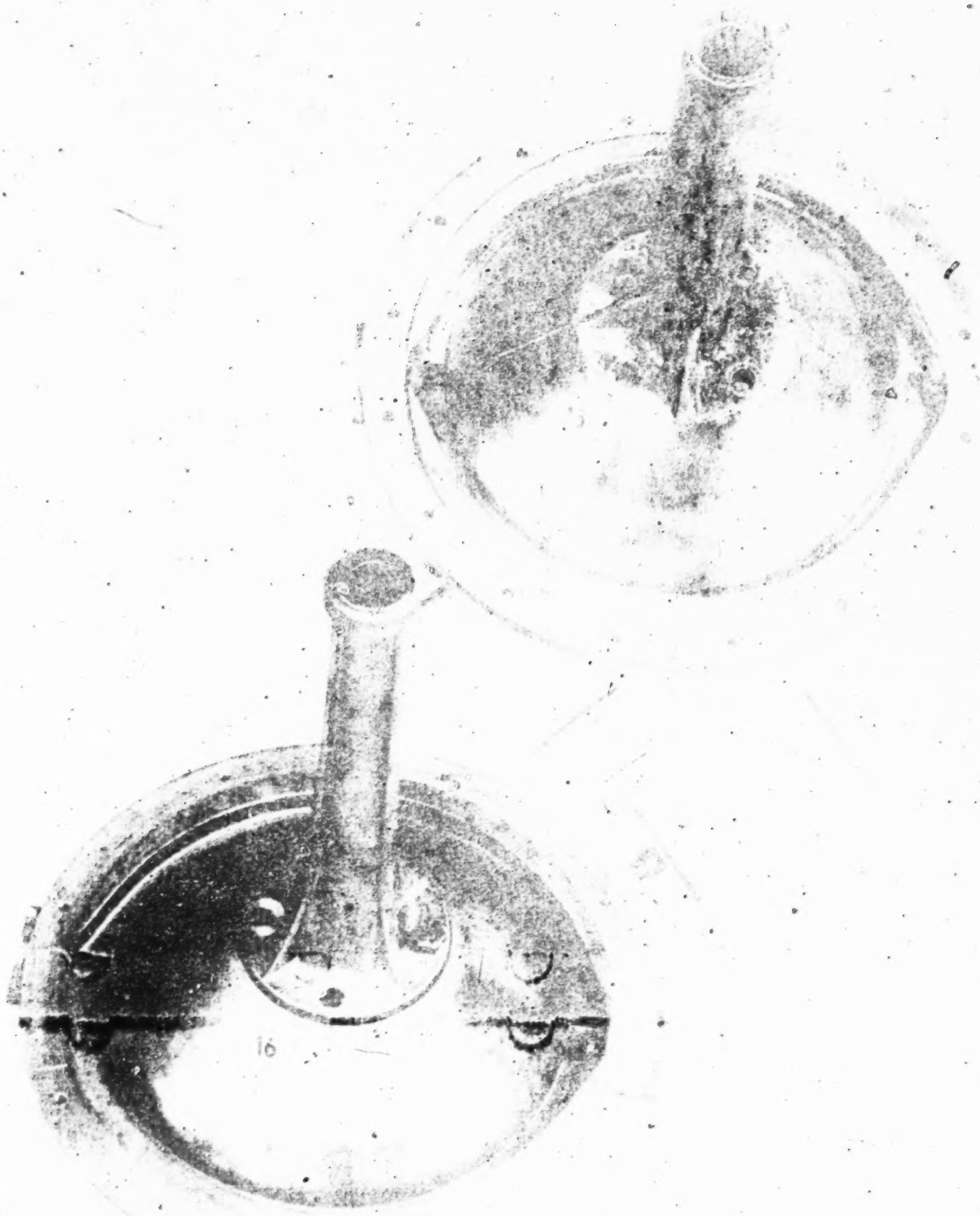
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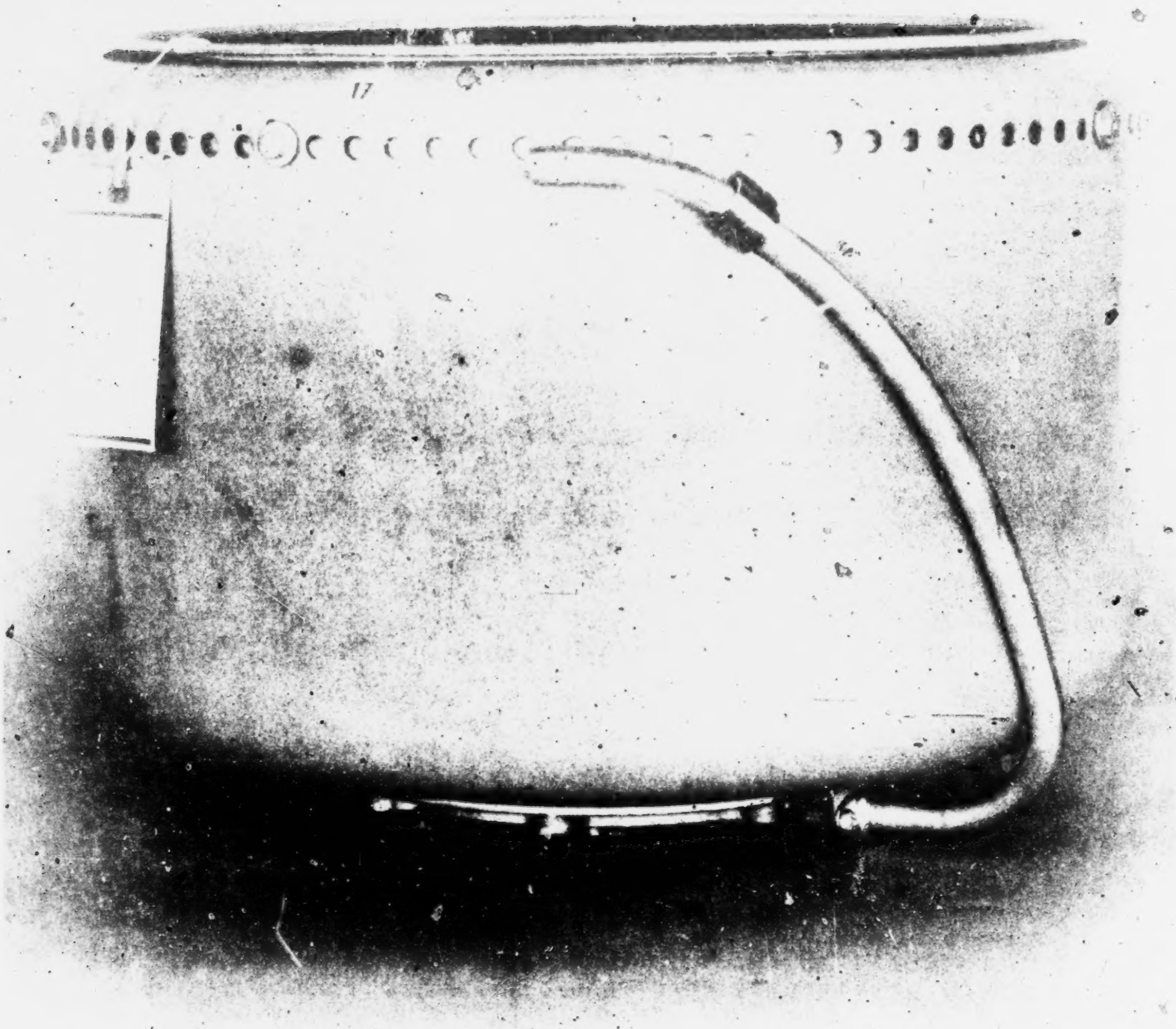

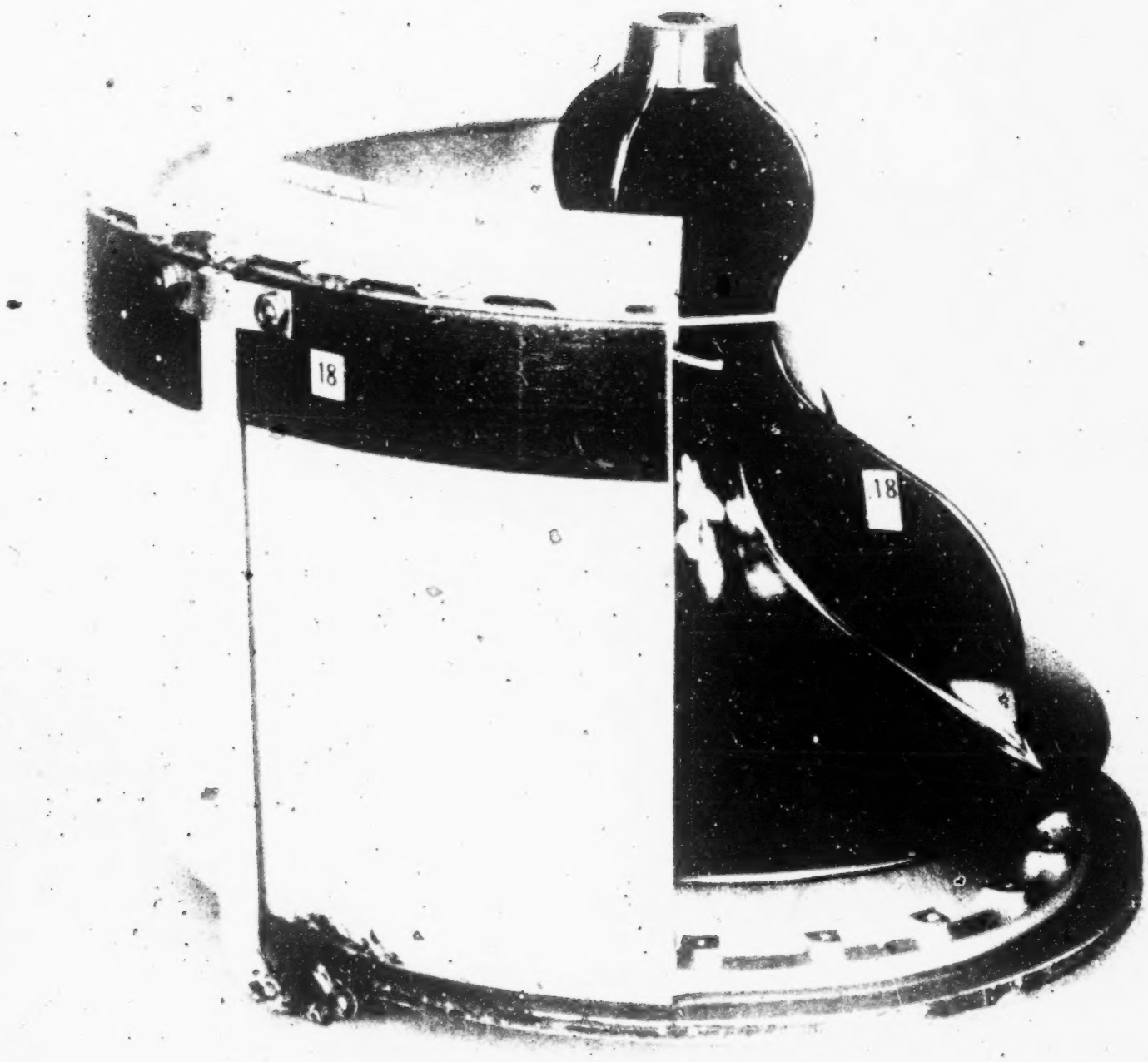
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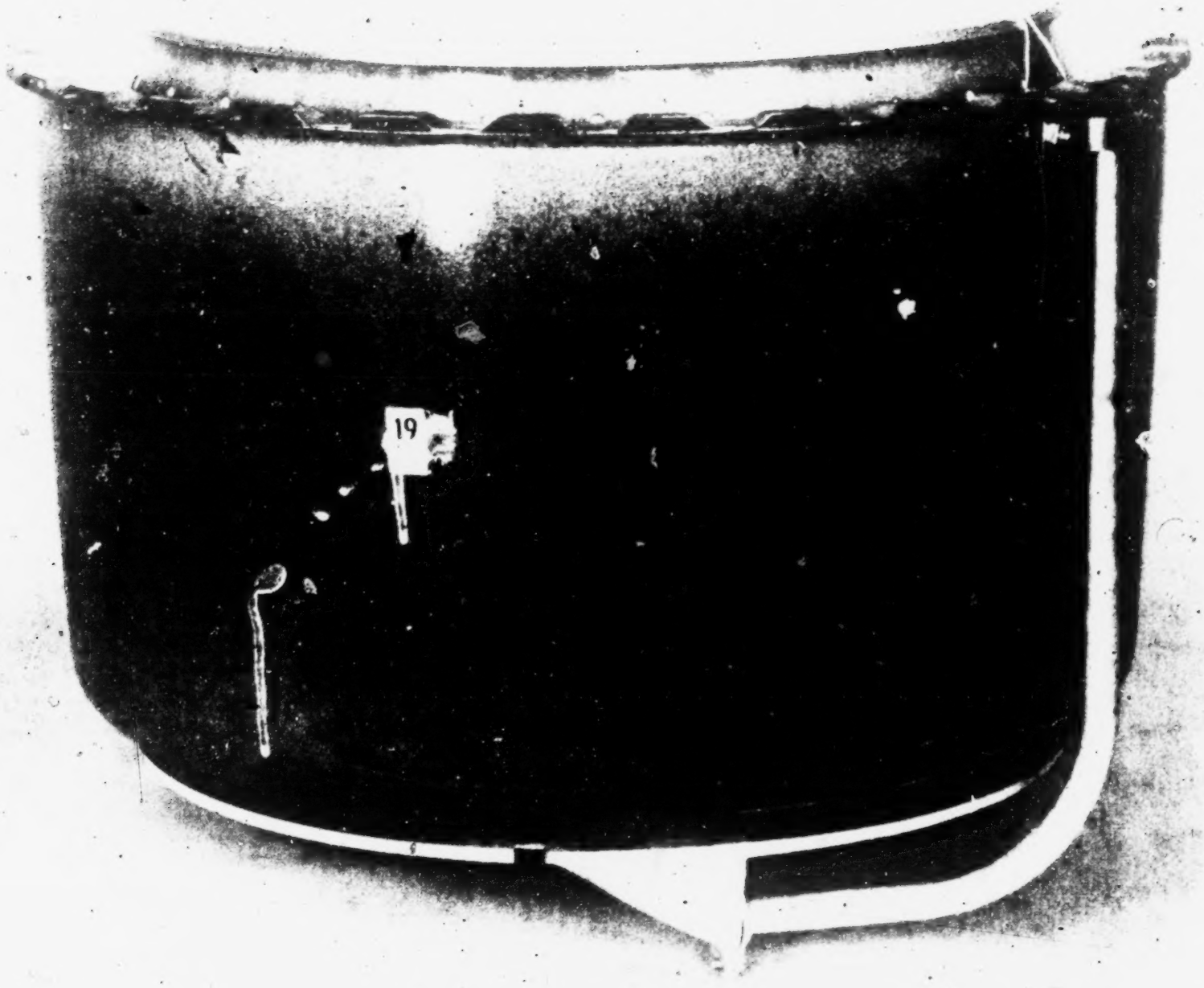
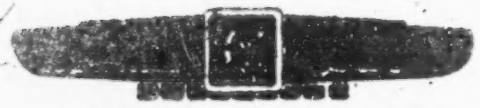

19

SPEED QUEEN CORPORATION

TELEPHONE BLACK 46

Manufacturers of



WASHERS, IRONERS AND DRYERS

HOME OFFICE
RIPON, WISCONSIN

May 13, 1955

Mr. C. F. Castner
Beam Manufacturing Co.
Webster City, Iowa

Dear George:

In reply to your May 10 letter, please be advised that we have used the sediment trap and sediment tube on all of our production to date except for our model A16. This model A16 is our semi-automatic machine and was placed in production in July of 1954.

We trust that this information will serve your purpose.

Yours very truly,

SPEED QUEEN CORPORATION

J. B. Murray
b

Executive Vice President

PLAINTIFF'S EXHIBIT 30

Pl. Ex. 31 - Carbon copy

EASY WASHING MACHINE
CORPORATION
SYRACUSE NEW YORK

SYRACUSE
NEW YORK

May 20, 1955

Mr. L. F. Castner, General Manager
Bean Manufacturing Company
Webster City, Iowa.

Dear George:

This is in reply to your letter of May 18, inquiring about our use of the sediment trap and sediment tube on our production of Automatic Washing Machines.

We have used the sediment trap and tube on all machines manufactured, and are using them at the present time.

I hope that your inquiry was not prompted because of conflict with some other patents. If so, please keep me advised.

Best regards,

Very truly yours,

EASY WASHING MACHINE CORPORATION

By_____
William P. Murphy, Vice President

WPM:EH

PLAINTIFF'S EXHIBIT 31

Hotpoint Co. 227 SOUTH SEELEY AVENUE, CHICAGO 12, ILLINOIS
TAYLOR 9-6000
A DIVISION OF GENERAL ELECTRIC COMPANY

May 23, 1955

Mr. G. P. Castner
General Manager
Beam Manufacturing Company
Webster City, Iowa

Dear Mr. Castner:

It was pleasant to talk to you this morning concerning the matters raised in your letter of May 10, 1955, relative to patent marking and the use of sediment ejection devices.

Some years ago, the General Electric Company decided to make the matter of marking patents on nameplates and the like optional with the various manufacturing divisions. In the appliance fields it has been decided not to mark the appliances with patent numbers, in view of the difficulties of keeping the nameplates up to date and the relatively small legal advantage which derives from patent marking. In view of the fact that our license agreement with you does not call for patent marking, we followed our normal practice of not marking.

We prefer, if at all possible, to maintain a strictly neutral attitude in connection with the litigation which you have brought against Norge. For that reason, unless compelled to do so, we would rather not make any statements concerning the use of sediment ejection devices on our automatic washing machines.

Very truly Yours,

AGH:GY

A. G. HUBBARD
Patent Counsel

50

PLAINTIFF'S EXHIBIT 32

Hotpoint Co. 227 SOUTH SEELEY AVENUE, CHICAGO 12, ILLINOIS
TAYLOR 9-6000
A DIVISION OF GENERAL ELECTRIC COMPANY

November 12, 1954

Mr. G. P. Castner
General Manager
Beam Manufacturing Company
Webster City, Iowa

Re: Castner Patent 2,648,213

Dear Mr. Castner:

Thank you very much for your letter of November 9, 1954.

We are planning to make the change which will separate the vortexing pins from the blades of the upper coupling element and thus avoid Claims 1 and 2 of the subject patent.

We have not been concerned with Claims 3 and 4 of the patent because we do not, and do not intend to, use the subject matter of the claims. Of course we recognize that even with the alteration of the fluid coupling, we will remain within the scope of patent 2,513,845.

We are always interested in mechanical improvements which will either increase performance or reduce cost. For this reason, we will be happy to consider the simplified clutching mechanism which you mention in your letter. However, it is by this time no secret that we are trying to design out of your patents and thus reduce or eliminate the royalty payments. Therefore, if we do consider your new clutching device, it must be on a non-confidential relationship which will leave us entirely free to investigate the validity of the potential patent and to challenge its patentability and validity, if we feel that we are justified in so doing.

Very truly yours,

A. G. Hubbard

A. G. HUBBARD

AGH:GY

PLAINTIFF'S EXHIBIT 33

Pl Ex 33P. Col ... Page 1.

November 9, 1954

Mr. A. C. Hubbard
Patent Counsel
Hotpoint Inc.
426 So. Seeley Avenue
Chicago, Illinois

Subjec : Fluid Drive Patents

Dear Mr. Hubbard:

I passed on to Andy Carlsen your fluid drive drawings and assembly and have not heard from him. It is his opinion that the coupler, as originally designed, comes within Claims 1 and 2 of Patent 2,648,213. It would avoid these two claims if modified as proposed in your letter of October 14th. Andy has expressed no opinion as to Claims 3 and 4 for the reason he says an interpretation on these claims would depend on the entire drive arrangement and not alone on the coupler design as covered in Claims 1 and 2.

Andy points out also that he has not given any consideration to these drawings from the standpoint of determining whether or not the disclosure would conflict with other patents or patents pending. He further states that there is no question but what the structure as you have submitted it in the drawing, would come squarely within the scope of Patent 2,513,845.

Andy's opinion, therefore, would not be an overall conclusion for the reasons mentioned. If you would care to submit the additional details, I would be glad to submit them to him so as to determine the scope of Claims 3 and 4 in Patent 2,648,213.

Incidentally, we have another development pending covering a new simplified clutching which we are covering in another application. We think this will be of interest to you in that it would fit in with the structure and save a minimum of $1.00 and possibly up to $1.50 per machine. We have had samples on test for the equivalent of forty years service and it functions just as perfectly at the end of that time as at the start. It affects this clutching without motor reversals and attendant adverse effects of hesitation periods and problems with over-running clutches, etc. We are making up additional samples and will have them available to submit to you within sixty days or so. It would be an overall part of the license package. We really think this is an outstanding basic feature of merit and if you would be interested, we will be glad to anticipate that and submit to you within the time mentioned.

Very truly yours,

[illegible] MANUFACTURING COMPANY

Riley
33A.
149 Exhibited U.P.

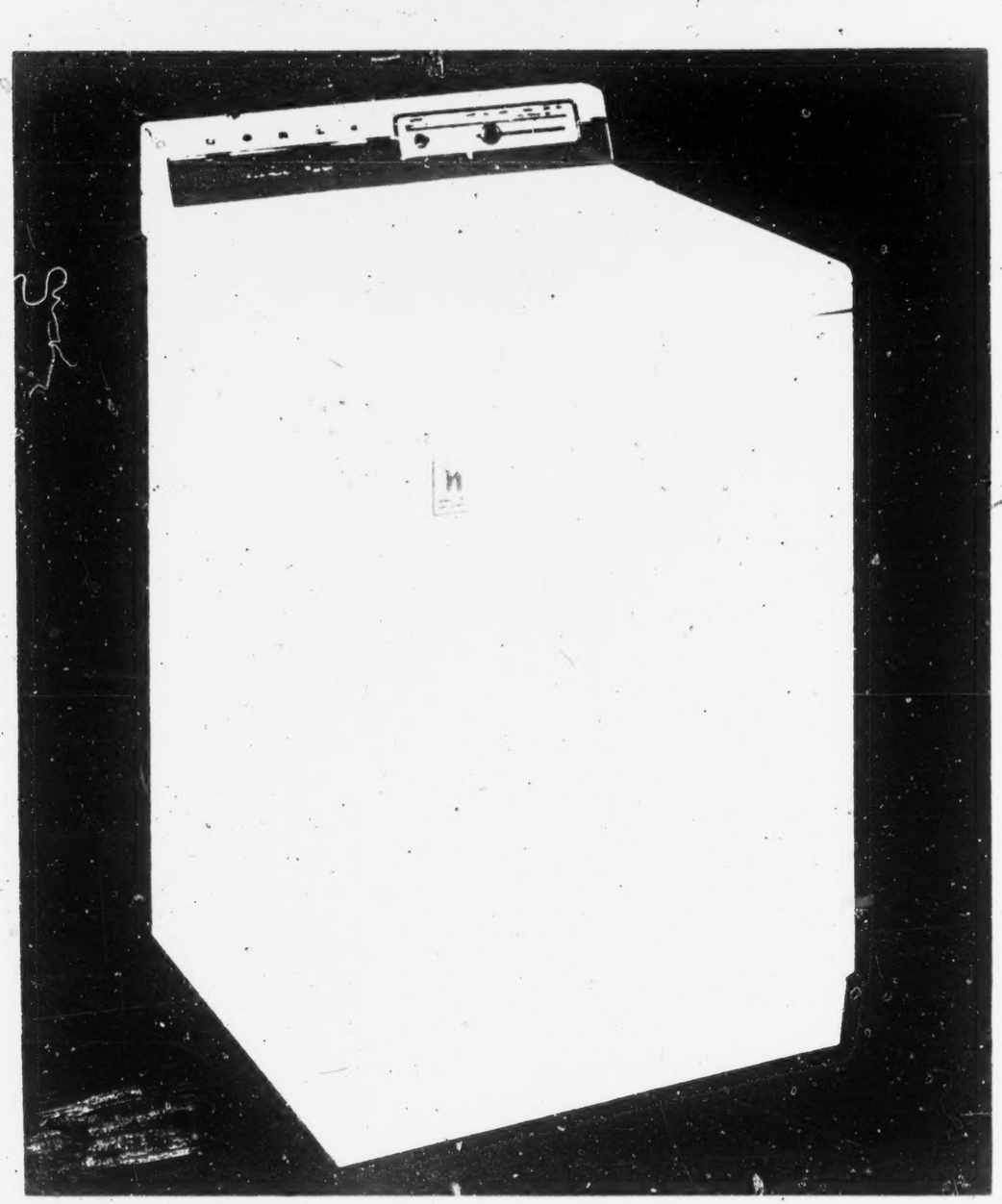
GPGa tner/mt

General Manager

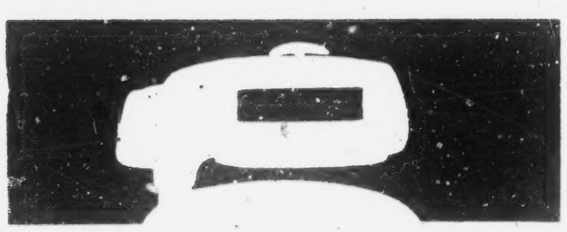
Blind copy to A.E.Carlsen

PLAINTIFF'S EXHIBIT 33-A

NEW ADDITIONS TO NORGE LINE



AW-422 — Norge Time-Line Automatic Washer featuring, for the first time on any automatic washer, a straight line time control, moving from left to right. This model also offers the new, exclusive Norge 4-double vane, Wave Action agitator. Backguard is designed to fit flush against kitchen or laundry room wall.



First Showing of Amazing New Time-Line Automatic Washer

CHICAGO—Dealers visiting the American Furniture Mart during the June Summer Market will be seeing, for the first time, the amazing Norge Time-Line Automatic Washer.

Norge can now boast the only automatic washer on the market with an easy-to-read, easy-to-use time control in a single straight line . . . the Time-Line.

This revolutionary change gives this new Norge washer the unquestionable title, "America's most convenient automatic washer."

When the Time-Line knob is pressed in at the "Fill" position, it begins moving from left to right along a well-marked path . . . each step of the way bringing on a new cleansing action.

NEW *EXCLUSIVE* AGITATOR

Another exciting feature of this sensational new washer is the Wave Action Agitator, especially designed to give a thoroughly efficient, four-way washing action—surface action, down through the suds, undertow action and upward movement.

Clothes in the tub follow that definite course during the "Wash" period, and tests run at the Herrin Plant rate this new automatic as having the highest washability of any automatic washer sold today.

TIDAL WAVE RINSING ACTION

When it comes to rinsing, the new Time-Line automatic again proves its superiority. In addition to two separate spray rinses, there's the Tidal Wave Rinse which combines three soil- and soap-removing actions.

The first of these is the surface overflow rinse during which the rinse water rises over the clothes level. Next comes the agitated overflow rinse. Soap and soil is carried over the top and down the drain. A deep-wave agitated rinse is the third component of the Tidal Wave Rinse.

To assure the removal of sand, grit and other heavier-than-water particles, Norge has included a ring of small openings in the bottom of the wash tub through which grit is forced out during the very rapid spin.

SUPER SPIN EXTRACTION

The Super Spin removes water from the tub in a matter of seconds. The final spin extraction lasts six full minutes, at the end of which all excess water has been removed and clothes are better than wringer-dry, ready for dryer or line.

This new feature-packed Time-Line Automatic Washer will be demonstrated continuously at the Norge space in the Furniture Mart.

NEW NORGE FULL-SKIRT MODELS PROVIDE "PLUS" STABILITY

Three new wringer washers will be making their debut at the Summer Market. Two of these models feature the full-skirt base design.

The two models, CW-250-PT and CW-240-P (and their corresponding non-pump models) have five, easy rolling casters, widely spaced to give maximum stability. These models have a wider base than any other full-skirt wringer washer on the market.

These models have the same sturdiness as that provided by Power Leg balance such as found on our CW-211 series.

But aside from new beauty and increased stability afforded by the new wringer washer line, these washers provide the same outstanding triple-washing action (Up, Down and Around) that has made Norge washers famous for excellent washing results.

The new 1951 Norge washer line is, without a doubt, the finest in the industry . . . tops for beauty, efficiency and dependability.

EXHIBIT 3

ANALYSIS OF ROYALTY ACCOUNTINGS FROM SOLAR CORPORATION LICENSEES

	HOTPOINT		SPEED QUEEN		EASY	
Year	Units	Royalty	Units	Royalty	Units	Royalty
1949	52,104	92,125.44				
1950	119,077	168,432.70				
1951	86,984	123,026.73				
1952	66,836	75,673.97				
1953	103,968	96,940.55	15,282	22,551.81	15,031	21,858.98
1954	92,893	86,613.06	26,244	38,713.24	28,818	38,983.53
1955	123,287	106,352.42	45,045	64,137.01	38,722	66,770.13
TOTALS	625,149	749,164.87	86,571	125,402.06	82,571	127,612.64

Total number of units manufactured and sold by Solar licensees, Hotpoint, Speed Queen and Easy through 1955 - 794,291

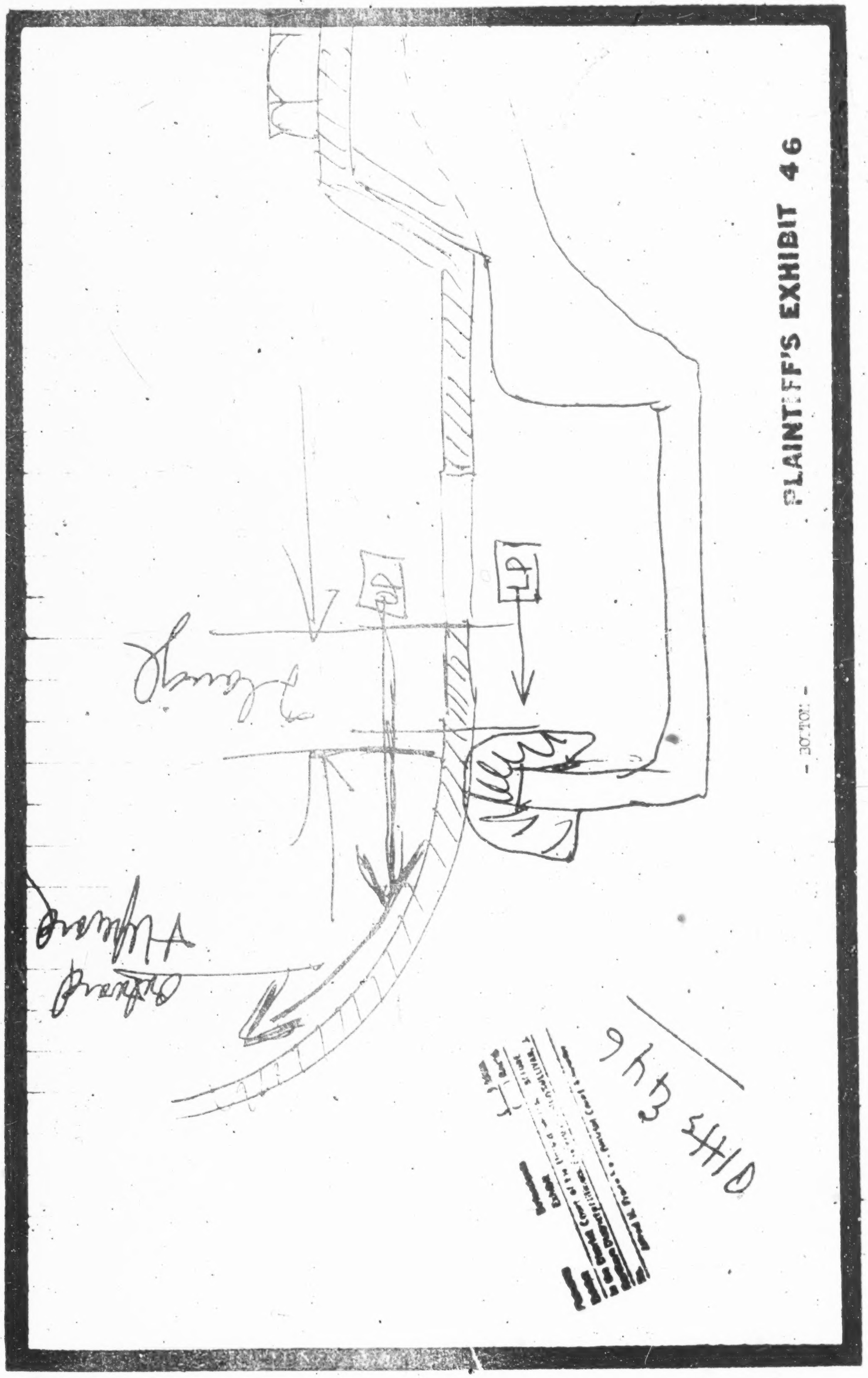
Total royalties paid under foregoing three licensees under Agreements Pl. Exhs. 40-41, 42 and 43 - 1,002,179.57

(Note - Foregoing figures do not include former Solar, Simpson, or present Beam production.)

Plaintiff's Exhibit 45.

552

PLAINTIFF'S EXHIBIT 45


PLAINTIFF'S EXHIBIT 46
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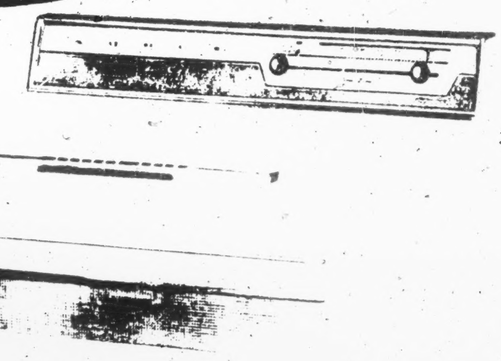
LP

Note

Pages 547 - 551 are on card 12.

New Norge Dual-Automatic Washer for 1956 is here with exclusive automatic reSUDSer!

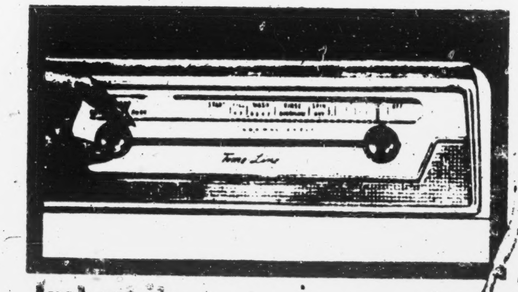


NEW dual TIME-LINE CONTROL makes Norge Washer MOST AUTOMATIC OF ALL!

Here are all the things you've wished for in an automatic washer . . . now they're a Norge washday wonder in your own laundry. Save work, time and money because you save suds, hot water and waiting—but most of all you save clothes. Norge's dual-cycle action does everything in the family wash exactly as it should be washed. Takes nothing out of your clothes but the soil, and does that to perfection.

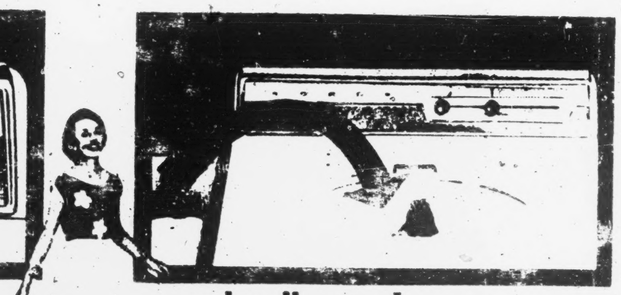
Look at the features of America's most automatic washer. Be sure your Norge dealer shows you how they work for you.

Norge automatic reSUDSer saves hot sudsy water and . . . lots of TIME!



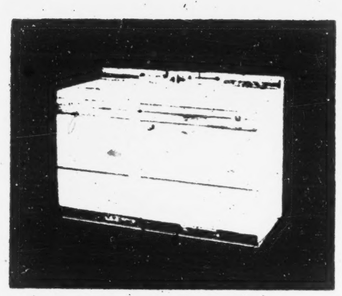
Just set it . . .

Your Norge washer automatically pumps the hot sudsy water into the set tub before rinsing cycle begins. When your second batch of clothes is ready for washing, all you do is turn to reSUDSer position on the Norge Time-Line Control . . .



. . . and walk away!

The washer goes into action automatically just as soon as all of the sudsy hot water has been returned to the machine. No mangling or tangling of clothes. No watching, no waiting. Save time along with soap and hot water.



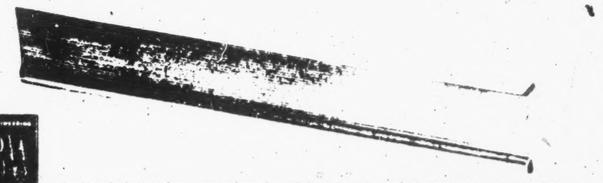
America's most beautiful laundry combination takes *all* the work out of washdays. Only Norge with the exclusive Hamper-Dor dries everything exactly right, because only Norge dries 4-ways.

NORGE AUTOMATIC "FIRSTS":

- **Dual-Cycle changes wash-action to fit the fabric . . . automatically.**
- **Multi-Rinse changes from mist spray to tidal wave . . . automatically.**
- **Time-Line Control starts, stops, repeats . . . automatically.**
- **Sediment-remover, water-fill, water-temperature controls—all work automatically.**
- **Buzzer signals completion of washing cycle . . . automatically.**

more - much more - from

NORGE



NORGE SALES CORPORATION, MERCHANDISE MART, CHICAGO, ILL. • SUBSIDIARY BORG-WARNER CORPORATION
IN CANADA: ADDISON'S LIMITED, TORONTO • EXPORT: BORG-WARNER INTERNATIONAL, CHICAGO, ILLINOIS

PLAINTIFF'S EXHIBIT 36

Pltf's Ex 36
Mfg. Exhibits

Pltf's Ex 36
Mfg. Exhibits

Holiday Fair to Be Musical

Opens Next Saturday

Favorite folk songs from many lands will be dramatized next week end at the 12th annual holiday folk fair in the Auditorium.

The program, "Folklore in Song," will be presented at 2 and 8 p.m. Saturday and again at 3 p.m., 4:30 p.m. and 8 p.m. Sunday. The Saturday matinee is presented by and for children. (Of the 4,500 seats in the hall, 850 may be reserved for each performance.)

The International Institute of Milwaukee County, sponsor of the annual nationality spectacle, also announced that Johnny Logan, Milwaukee Braves shortstop, would meet children attending the fair from noon to 2 p.m. on opening day, Saturday.

Salute on Radio

The 12th annual Milwaukee holiday folk fair will be saluted at 8:30 p.m. Monday by the Citizen Service Band of America, conducted by Paul Lavalle. The "Footlifter March" by Henry Fillmore will be played in tribute to the Milwaukee event. The program can be heard over WTMJ. The Milwaukee Journal radio station.

Many Nationality Groups

Seventy-six organizations representing 35 nationality groups are working on this year's fair featuring heirlooms, exhibits, salon booths for imports and craft work, an "international sidewalk cafe" and the dance program. British, Hawaiian, Japanese, Latvian, Serbian and Russian contributions will be new this year.

Rehearsals are under way in many parts of the county for the dance groups. Larger groups have been practicing at the YMCA.

A new group of Hmongkuans this year will present a stylized dance featuring the rhythmic clicking of flat lava stones held in the fingers like castanets. For the women participants, the group has fashioned skirts of split leaves with red borders and yellow bra. The men will wear blue pants, white shirts, red sashes and red ties.

Pilgrims Will Dance

Pilgrims will do their "Dance of the Long Necked Bird," for which the rhythm is beaten out with bamboo poles.

Some 25 men and women will perform a Spanish dance based on the thanksgiving harvest time "romeria," or pilgrimage, to the village church. The religious service is followed by a fiesta featuring the "queen of flowers."

French participants will be joined by agenda of Belgian and country in a wedding folk dance "La Bourree," typical of the province of Auvergne. Some 15 adults and children are working on their roles and preparing costumes for the performances.

This inlaid wooden plate, made by a Latvian craftsman in Chicago, will be exhibited at the holiday folk fair at the Auditorium Nov. 19 and 20. Rudolfs Purins, 6830 Aztec ct., Wauwatosa, displayed the plate made by Imants Karklins.

1,000 Bits of Wood in Plate; Holiday Fair Will Display It

More than 1,000 small bits of wood have been fitted together to form the inlaid wooden plate which will hang in the Latvian exhibit at the holiday folk fair next Saturday and Sunday at the Auditorium.

The plate, 21 inches in diameter, was fashioned by a Chicagoan Latvian craftsman, Imants Karklins. It was designed by Rudolfs Purins, 6830 Aztec ct., Wauwatosa, a Milwaukee Latvian participating in the annual fair sponsored by the local International Institute. Rudolfs Purins, 6830 Aztec ct., Wauwatosa, is the folk fair chairman for the group.

The wooden plate features an inland border of autumn leaves on a pale birch background. The center picture shows a girl in a wheat field. She wears the Latvian national costume. All of the color and pattern of the dress (the folds of the skirt, the cloak above and the beads of grain be-

The New Wonder Polar
VENTIL PLASTIC
$5.49

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A CLOCK IN EVERY ROOM
CLOCKS OF ALL KINDS
BELL CLOCK SERVICE
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HEARING GLASSES
THE FIRST complete hearing aid built right into your own or the latest style of eyeglass frames retaining your of a normal appearance. This lighter weight and perfect balance gives you better wearing comfort. Choice of frame colors to match your hair. No cord or clothing wires, no transmitter box or separate ear button and available for men or women. Reasonably priced. Normal delivery.
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Physical Education to Be County Topic

Physical education and recreation programs in the county schools will be the main discussion topics at the annual fall institute ... [illegible] ... for school board members of the dairying and recreation county system Wednesday.

New to the fair this year will be the Latvian sales and food booths. Recorded Latvian folk songs will be a feature of the sales display while at a booth in the "sidewalk cafe" Latvians will serve their appetizers, a kind of meat roll with a cup of broth.

The meeting will be at 7:30 p.m. in the civil service examination room of the courthouse. Orlo W. Miller, coordinator of school health for the state department of public instruction in Madison, and Donald Brault, supervisor of physical education and health education in the county schools, will speak.

See The Journal for resorts

Shop Monday, 9:30 'till 9 p. m.
1/3 OFF IF PERFECT PRICE!
Therapeutically correct nylon surgical hose
You need no orthopedic Doctors have prescribed these to aid in relief of surface varicose veins, leg cramps and fatigue . . .
only 5.88 pair
SECONDS. Step alone comfortably and look neat. Our therapeutically correct sheer 15 denier. Two-way stretch for more support. Full foot with firm heel anchorage and arch rest. Sizes 9 to 11 in short, medium, long and extra long.
Surgical Department
Street Floor, Balcony
Mail and phone orders taken 24 HOURS EVERY DAY . . . call Broadway 1-6800. Please give register tapping area and measurement when standing from bottom of heel to point of normal garter attachment. Please give shoe width A, C or even.

'56 NORGE WASHER WITH SUPER ACTION
HAS 5 SEPARATE PURIFYING ACTIONS!
1 TWO FORCE-SPRAY RINSES
2 OVERFLOW RINSE
3 AGITATOR OVERFLOW RINSE
4 AGITATOR DEEP RINSE
5 AUTOMATIC LINT DISPOSAL
Fresh, lint-free water flushes away everything from tobacco strands to sand . . . automatically!
• No puny "squirt" rinses.
• No messy strainers or dirt catchers.
• No re-circulation of dirty, used rinse water back through clean clothes.
Two separate cycles wash everything from blue jeans to unknowns . . . automatically!
Flick the Time-Line control to one setting and you have a fully automatic regular cycle for family loads. Flick it to another setting and you have a fully automatic short cycle for part loads, lightly soiled clothes, and delicate fabrics. It's like having two automatic washers in one! And there's even a special "Rightcare" way to wash unknowns and sheers like blankets automatically, and with 100% safety. Automatic signal tells you when washing is done.
New Norge rollator gives you first fully automatic suds return system!
No more watching, no more waiting! The 1956 NORGE automatically stores your hot suds water from the first load. When you're ready for your second load, just drop in the clothes, turn that magic knob, and walk away. Your precious suds water is pumped back in, agitation starts, and your second washing cycle goes right on, all automatically.
NORGE Automatic Washers and Dryers
Priced from $129.95 to $349.95
Giant Trade-Ins — Easy Monthly Terms
SATISFACTION GUARANTEED OR YOUR MONEY BACK...
SEE THE '56 NORGE WASHER AND DRYER NOW!
MILWAUKEE
AA Appliance
Better Home Appliance Co.
Ray Carpentier
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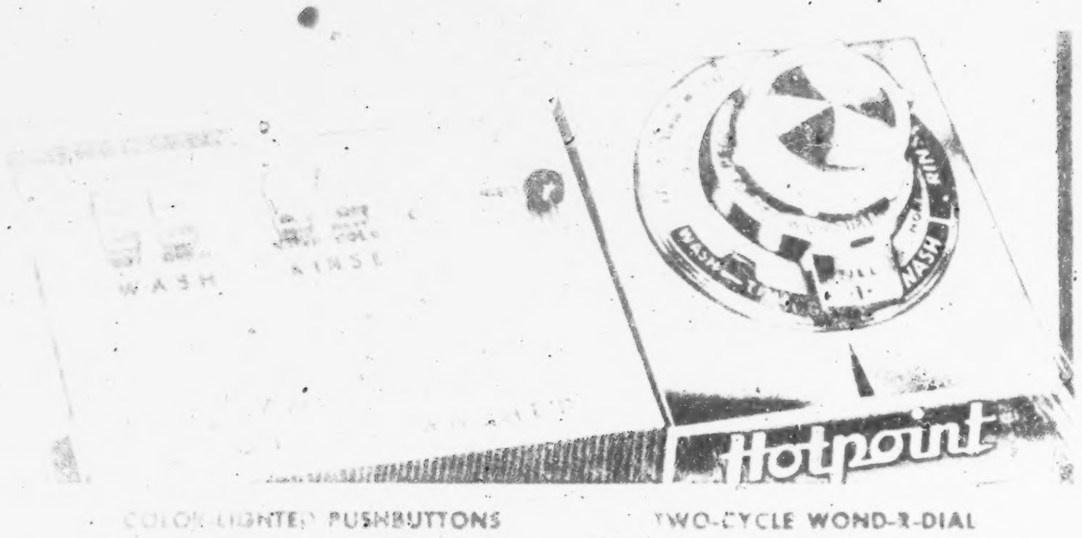
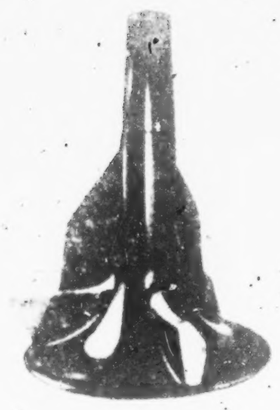
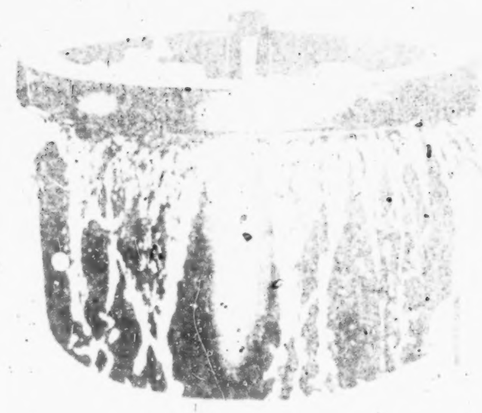
Charles Furniture
Henry Calder Co.
Erv's Radio & Appliance
J & J Refrigeration
Kitchen Sales & Appliance
K K Television
Kornely Hardware
Kramarz Auto Supply
Kruthamp Electric
Mueller Radio
Nies Furniture
Raffels Furniture Co.
Rossel's House of Savings
Roehl-Roth
Samsons
Schuster's
South Side Sales
Triangle TV & Appliance
Veteran's Appliance
HALES CORNERS
Rhines Appliance Co.

PLAINTIFF'S EXHIBIT 37

Pl. Ex 38
Carlson
Boyer
SUPER DELUXE Hotpoint
PUSHBUTTON Automatic Washer
MODEL LK11
AVAILABLE IN
Col rtone







COLOR-LIGHTED PUSHBUTTONS
Provide automatic pre-selection of both wash and rinse water temperatures – hot or warm for washing; warm or cold for rinsing. Saves time, work, clothes and hot water.

TWO-CYCLE WOND-R-DIAL
Normal Cycle for heavily soiled and regular fabrics . . . Delicate Cycle for lightly soiled and man-made fabrics. Automatic fill for full or partial loads . . . automatic pre-selection of wash time.

RUBBER-FINNED AQUATATOR
Scientifically designed to provide vigorous *counterflow* water action. Flexible rubber fins create thorough yet gentle washing action . . . safe for all fabrics; washes all clothes cleaner.

DEEP OVERFLOW RINSE
Floats suds and soil up and out of tub instead of through the clothes . . . eliminates problem of soap scum. Thorough agitated rinsing removes suds, film and soil. Leaves clothes really clean.

Hotpoint SUPER DELUXE

PUSHBUTTON AUTOMATIC WASHER MODEL LK11

Automatic Fill . . . water automatically fills to correct level for either full or partial loads . . . agitation starts – automatically – and continues for the length of time you pre-select.

Spin Tub . . . spins clothes twice during complete cycle. Spins out soil and suds after wash period . . . spins clothes damp-dry after rinse cycle. Rotates at 650 rpm. . . . smooth porcelain finish.

Smooth Operation . . . Central snubber and support absorbs vibration. Assures smoother spinning and more dependable operation.

Economical Operation . . . National average water costs show that *total* water usage in a Hotpoint costs only $3.53 a year – less than a penny a day, figuring seven full loads a week. However, *heating* water is another matter. And Hotpoint's exclusive Aquamatic wash-rinse action uses *less* hot water than any other leading automatic . . . National averages show savings up to $15.60 per year in water heating costs.

SPECIFICATIONS

Cycle Times . . . Normal Cycle: 29 minutes minimum, 41 minutes maximum. Wash time: automatic pre-selection from 3 minutes to 15 minutes. Delicate Cycle: 16 minutes minimum, 18 minutes, maximum. Wash time: 3 minutes.

Spin Speed . . . 650 revolutions per minute.

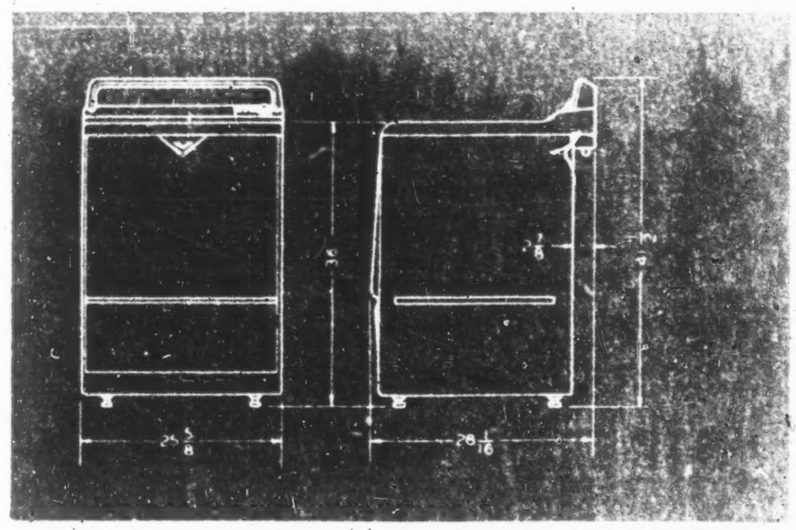
Motor Protection . . . Automatic Circuit Breaker protects motor from overload . . . no fuses to replace . . . simply push convenient reset button at right of pushbuttons.

Electrical Requirements . . . 115 volts, 60 cycle, A.C. (15-ampere separate branch circuit is recommended.)

Shipping Weight . . . Approximately 250 pounds.

Flush-to-Wall installation.

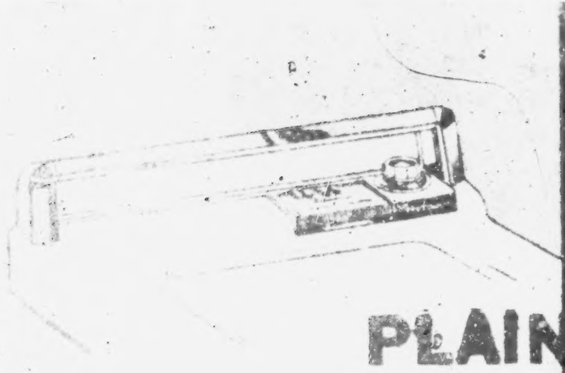
This appliance listed by Underwriters' Laboratories, Inc.



Adjustment of leveling legs may increase height a maximum of one inch.

Hotpoint Co.
Division of General Electric Co.
5600 West Taylor Street · Chicago 44, Illinois

Hotpoint Co. has a policy of continuous improvement on its products and reserves the right to change materials and specifications without notice.



PLAINTIFF'S EXHIBIT 38 (Mark)

FLUORESCENT-LIGHTED BACK PANEL
Adds distinctive beauty . . . illuminates Wond-R-Dial, Pushbuttons and top of washer. When lid is open, light shines down into tub. Especially useful where laundry area is dimly lighted.

ALL-PORCELAIN FINISH INSIDE AND OUT
Glass smooth porcelain finish resists stains, cleans easily. Provides a rust-resistant finish that protects all surfaces. Increases long life of washer. Pampers even the most delicate fabrics.

ONE-PIECE BATTLESHIP CONSTRUCTION
The one-piece cabinet functions as the drain tub effectively combining long-life, rust-resistant porcelain with welded-steel construction. Another reason for Hotpoint durability.

AUTOMATIC SEDIMENT SWIRL-OUT
Particles of soil and sand are trapped at the bottom of the tub and swirled out *automatically*. There are no attachments or accessories to remove, clean and replace. It's all *automatic*.

10-55 100M Printed in U.S.A.

WAREHOUSE SALE

HELD IN OUR STORE FOR YOUR COMFORT & CONVENIENCE

HEY KIDS! GET YOUR **FREE** DAVY CROCKETT TENT

WHEN MOM OR DAD BUYS ANY AUTOMATIC WASHER, DRYER OR REFRIGERATOR **HILL'S**

SAVE $60.00 ANNIVERSARY SPECIAL

1955 NORGE CUSTOMATIC Refrigerator-Freezer

Pay Later

$4.50 Weekly

Your Old Refrigerator Is Your Down Payment

YOU GET ALL THESE FEATURES

- Exclusive Norge Vitamin-A-Guard Control
- Giant 60 lb. Freezer Compartment
- Double-Deep Humidrawer Storage
- Twin Porcelain Crispers
- Tall Bottle Shelf

...and many more Norge extras!

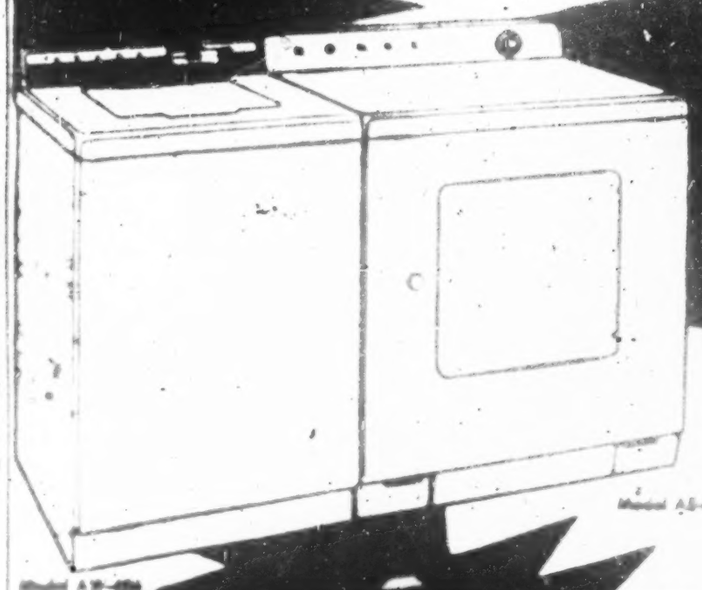
REGULAR PRICE $359.95

NORGE MAY ANNIVERSARY SPECIAL $289.95 AND OLD REFRIGERATOR

Complete NORGE Automatic HOME LAUNDRY

Hill's Value Days

Rated No. 1 by Consumers Research



IF YOU BUY NOW!

ONLY $299.90

NO TRADE-IN NECESSARY

FAMOUS NORGE WASHER - DRYER GET BOTH!

PUSH-BUTTON AUTOMATIC WASHER	AUTOMATIC ELECTRIC CLOTHES DRYER
• Push buttons for washing, rinsing, spin drying • Super-agitor, porcelain tub • Full capacity, all fabrics' fearless • Built-in Suds Saver	• Full-size 1955 automatic electric model • Use on 110 or 220 volts—no costly installation • Large clothes port, super-volume blower fan.

AUTOMATIC WASHER	$229.95
AUTOMATIC ELECTRIC DRYER	$149.95
REGULAR PRICE	$379.90

Here's your *once-in-a-lifetime* chance to own a complete NORGE *automatic* home laundry—both washer and dryer—for the price you'd expect to pay for one appliance.

Act now—take advantage of this special *introductory* offer—never work on washdays again!

LOW DOWN PAYMENT • EASY MONTHLY TERMS

SATISFACTION GUARANTEED Or Your Money Back

$60 to $100 for your old set on a New 1955 EMERSON TV

Hill's

AT HILL'S YOUR OLD TELEVISION IS WORTH $100 ON A NEW EMERSON TELEVISION! OTHER MODELS TO CHOOSE FROM!

Emerson Table Model 21"

New 21-inch Picture Tube Design—Provides greatest picture area ever achieved on a 21 inch tube. A full 270 square inch viewing area. Specially treated safety front glass prevents all glare. Also provides better contrast for more restful viewing.

Aluminized Picture Tube—Special electronic process on picture tube face now projects a light on the face of the tube permitting more brightness than ever before.

Super Powered Long Distance Circuit—Electronic Emerson circuit design brings unsurpassed television reception to even the fringe areas, the difficult reception areas and strong signal city center areas.

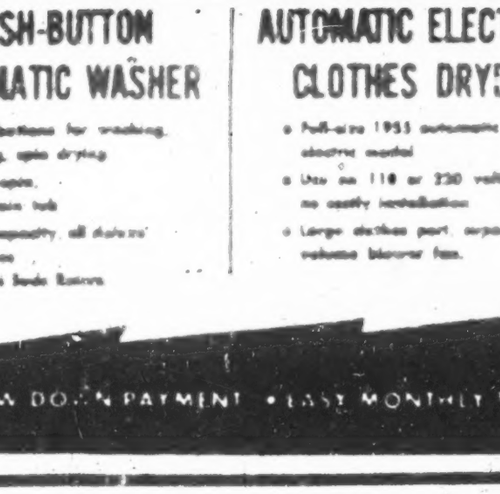
LIST PRICE $209.95

TRADE IN $ 60.00

Hill's NOW $149.95

NO DOWN PAYMENT

Now Is the Time to Trade



Revolutionary dynapower chassis. Costs half as much to operate as other TV sets. Parts last up to 10 times longer. Gives you the brightest, clearest, most stable pictures ever!

Emerson 21" TV

- Tilt front, all screen
- One knob Simplimatic side tuning
- Built-in antenna
- Full fidelity sound system
- Fashion styled cabinet with decorator finishes

LIST PRICE $219.95

TRADE IN $ 60.00

Hill's NOW $159.95

UP TO 18 MONTHS TO PAY

Swivel base mates viewing a pleasure from any seat in the room ... makes cleaning underneath simple!

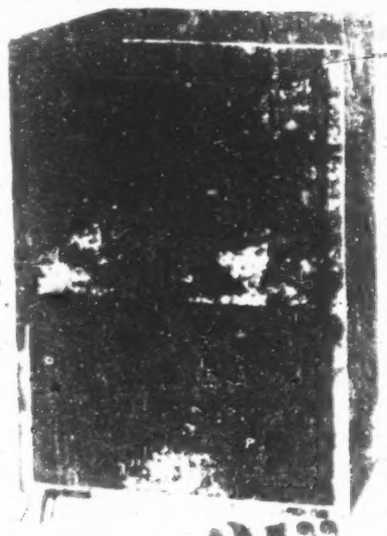
Over 21 inch 270 square-inch aluminized picture tube!

New Soft-ray Glass ends TV glare!

Powerful built-in directional antenna

Simplimatic side tuning

Modern wood cabinet in rich decorator finishes



Emerson 21"

NEW 1955

LIST PRICE $229.95

TRADE IN $ 60.00

Hill's NOW $169.95

3 6 EXHIBIT

W. O. KING.

ORE CONCENTRATOR.

APPLICATION FILED MAR. 7, 1910.

974,075. Patented Oct. 25, 1910

Fig. 1.

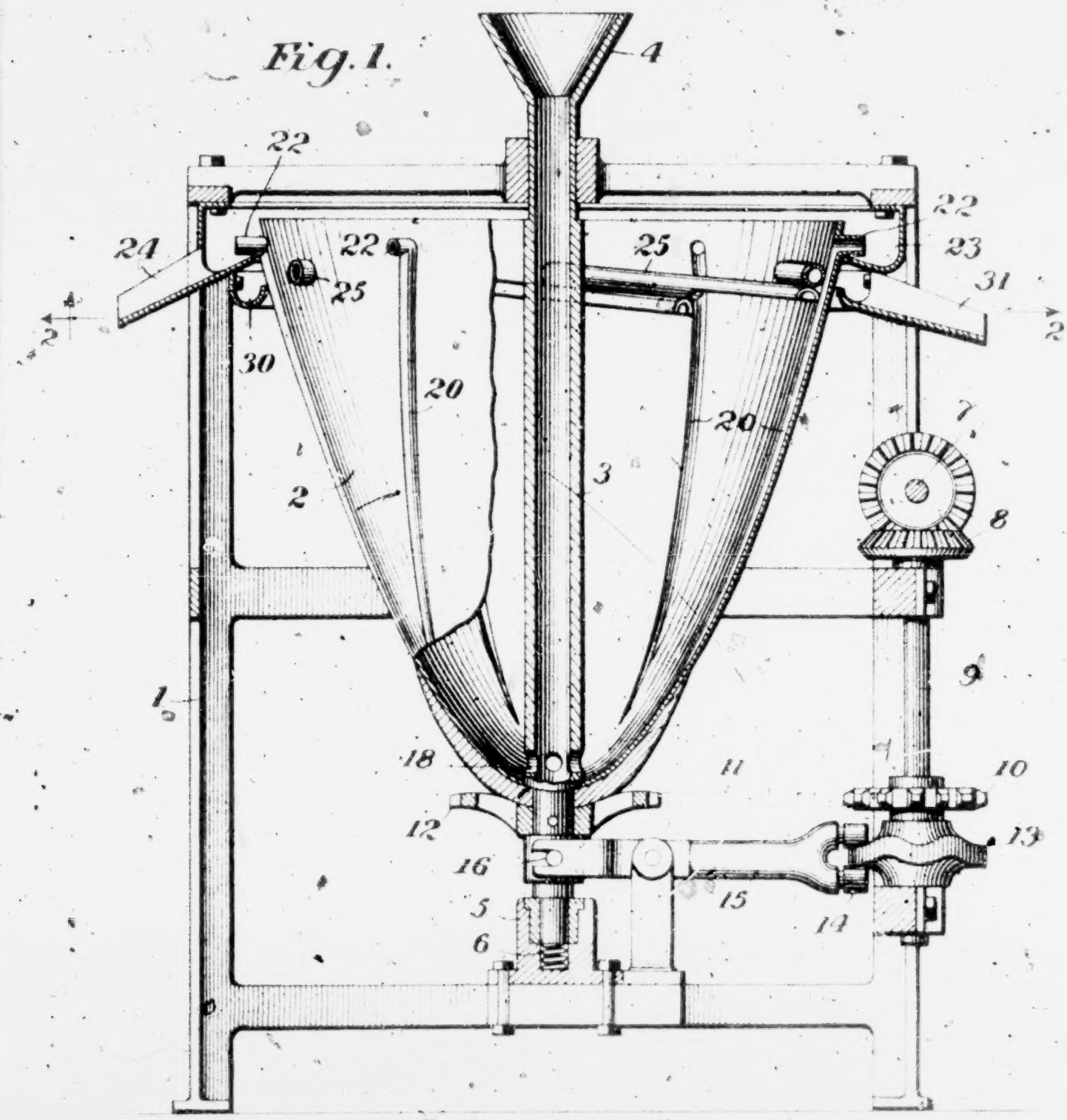
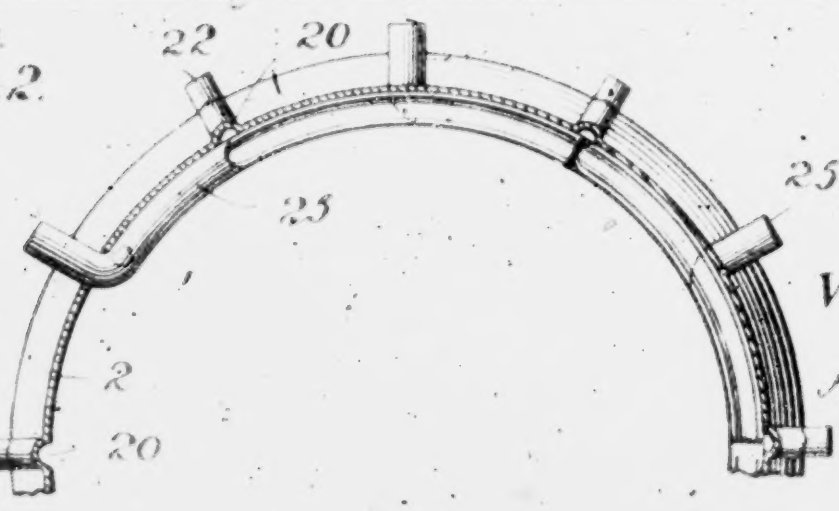


Fig. 2.



Witnesses
J. Gothinkel
A. R. Gaines

Inventor
W. O. King
by
Howard & Coombs
his Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM O. KING, OF MOUNTAIN HOME, IDAHO.

ORE-CONCENTRATOR.

971,075. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed March 7, 1910. Serial No. 547,801.

To all whom it may concern:

Be it known that I, WILLIAM O. KING, a citizen of the United States, residing at Mountain Home, in the county of Elmore and State of Idaho, have invented new and useful Improvements in Ore-Concentrators, of which the following is a specification.

My invention relates to centrifugal ore concentrators, by means of which the heavier and more valuable portions are separated from the lighter and less valuable portions of ore-bearing sands, crushed quartz, or the like.

More particularly stated, my invention resides in certain improvements which I have made in the construction of the bowl, whereby the separation of the heavier concentrates from the lighter tailings and refuse is rendered more complete and efficient than has heretofore been possible with existing machines, as far as I am aware, especially the concentration of certain ore-bearing sands, such as are found for example, in the Snake River.

I will now describe the improvements which I have made to the construction of the bowl in detail, reference being made to the accompanying drawing, in which,

Figure 1 is a sectional side elevation of my improved concentrator, and Fig. 2 is a half-plan sectional view of the bowl taken on the line 2—2 of Fig. 1, looking upward.

1 represents the frame of the concentrator, on which the bowl 2 and its actuating mechanism are supported. The bowl 2 is secured to and carried by a hollow shaft 3, the top of which may be funnel-shaped, as shown at 4, and the lower end of which is journaled in a step-bearing 5, in which it rests on a spring 6. The shaft 3 and bowl 2 are rotated from a driving shaft 7, connected by bevel gears 8 with a vertical shaft 9, on which is carried a sprocket-wheel 10, driving, by means of the chain 11, the sprocket-wheel 12, secured to the shaft 3. On the shaft 9 is also mounted a double face cam 13, with the opposite faces of which contact rollers 14 carried by the forked end of a lever 15, pivoted on the frame and engaging with its slotted other end pins 16, secured to the shaft 3. Thus the bowl is not only rotated from the driving shaft 7 but is also vertically reciprocated, as is common in machines of this class. The bowl itself is paraboloic in section, and the ores to be concentrated or the sands to be separated are fed with water into the bowl through the hollow shaft 3, which is provided with lateral openings 18, communicating with the bowl near the bottom thereof.

The wall of the bowl is provided with a series of substantially vertical grooves 20, starting near the bottom of the bowl and increasing in depth toward the top, where they communicate with discharge openings 21 provided with short spouts 22. These grooves are not absolutely straight in the vertical direction but are curved slightly in the opposite direction to that in which the bowl is rotated, being equally spaced from each other and, in the example shown, being six in number. The purpose of these grooves is to lead the concentrates upwardly to said discharge openings. The concentrates being the heaviest part of the material being treated will naturally be thrown against the sides of the bowl and, by reason of its speed of rotation and agitation, will be forced upward along said grooves and through the discharge pipes 22, from which they fall into an annular trough 23, from which a spout 24 leads at some convenient point. The tailings or lighter portions of the material will also be forced upwardly by the centrifugal action and for their reception I have provided substantially horizontal means located intermediate of said grooves at a short distance below the tops thereof, said means consisting of a series of tubes 25, equal in number to the said grooves and having their lower halves cut away in that portion of them lying between one groove and the next, while for the remaining length of said tubes, which amounts to one half the distance between two adjacent grooves, the tubes are left full, and said full or uncut-away parts of the tubes, communicate with discharge openings 26, in the wall of the bowl, the plane of said openings being below that of the discharge openings 21 of the grooves 20, and each discharge opening 26, being located half way between each pair of adjacent grooves 20. These tubes are arranged, as stated, substantially horizontally but are slightly inclined upwardly toward their discharge ends and overlap each other as shown in the drawing. The cut away portions of the tubes form barriers or stops for the lighter material between the grooves 20 and owing to their slight upward inclination conduct said material into the uncut-

away portions of the tubes and thence to the discharge openings 26, from which the tailings or refuse material is collected in an annular trough 30, from which a spout 31 leads off at some convenient point.

The operation of my improved concentrator will be readily understood from the above description. It will be seen that it provides for a continuous separation of ore-bearing sands or the like, the concentrates being continuously delivered from the bowl and collected at one point, while the tailings or refuse are delivered and collected at another.

Having thus described my invention what I claim is—

1. In an ore concentrator of the type described, a separating bowl parabolic in section and provided near its top with discharge openings for the concentrates and means to conduct the same thereto, and also provided with discharge openings for the tailings, located in a plane below that of the discharge openings for the concentrates, and independent transverse obstructing means located between each pair of discharge openings for the concentrates to conduct the tailings to their discharge openings.

2. In an ore concentrator of the type described, a separating bowl in the wall of which are provided a series of equidistant substantially vertical grooves, increasing in depth from near the bottom of the bowl to near its top and communicating there with discharge openings, and an equal number of substantially horizontal tubes, located near the top of the bowl below the level of said discharge openings, each tube extending throughout substantially one-and-one-half times the space between adjacent grooves and the lower half of each tube being cut away in that portion of it which extends from one groove to the next, the other ends of said tubes communicating with discharge openings located midway between but slightly below the discharge openings of said grooves.

3. In an ore concentrator of the type described the combination of a hollow vertical shaft, a parabolic bowl secured thereto, said shaft having openings in its wall communicating with said bowl near its bottom, and means to rotate and reciprocate said shaft, said bowl having a series of substantially vertical grooves communicating with discharge openings for the concentrates near the top of the bowl, and with substantially horizontal means located between each pair of said grooves near the top thereof to arrest and catch the tailings, substantially horizontal tubes communicating with said means and with a second series of discharge openings located intermediate of said first mentioned openings, and stationary means surrounding said bowl to receive the concentrates and tailings respectively.

4. In an ore concentrator of the type described, a centrifugal bowl, the wall of which is provided internally with a series of equidistant longitudinal grooves communicating near their tops with discharge openings in said wall, an equal number of independent transverse obstructing means located between said grooves near their tops, an equal number of independent tubes communicating with said obstructing means and with another series of discharge openings intermediate of said first mentioned openings, and means to rotate and reciprocate said bowl.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM O. KING.

Witnesses:
THOMAS TRASHEN,
ROY A. GEROLAMY.

March 22, 1932. W. L. WRIGHT **1,850,821**

WASHING MACHINE

Filed July 30, 1926

Fig. 1.

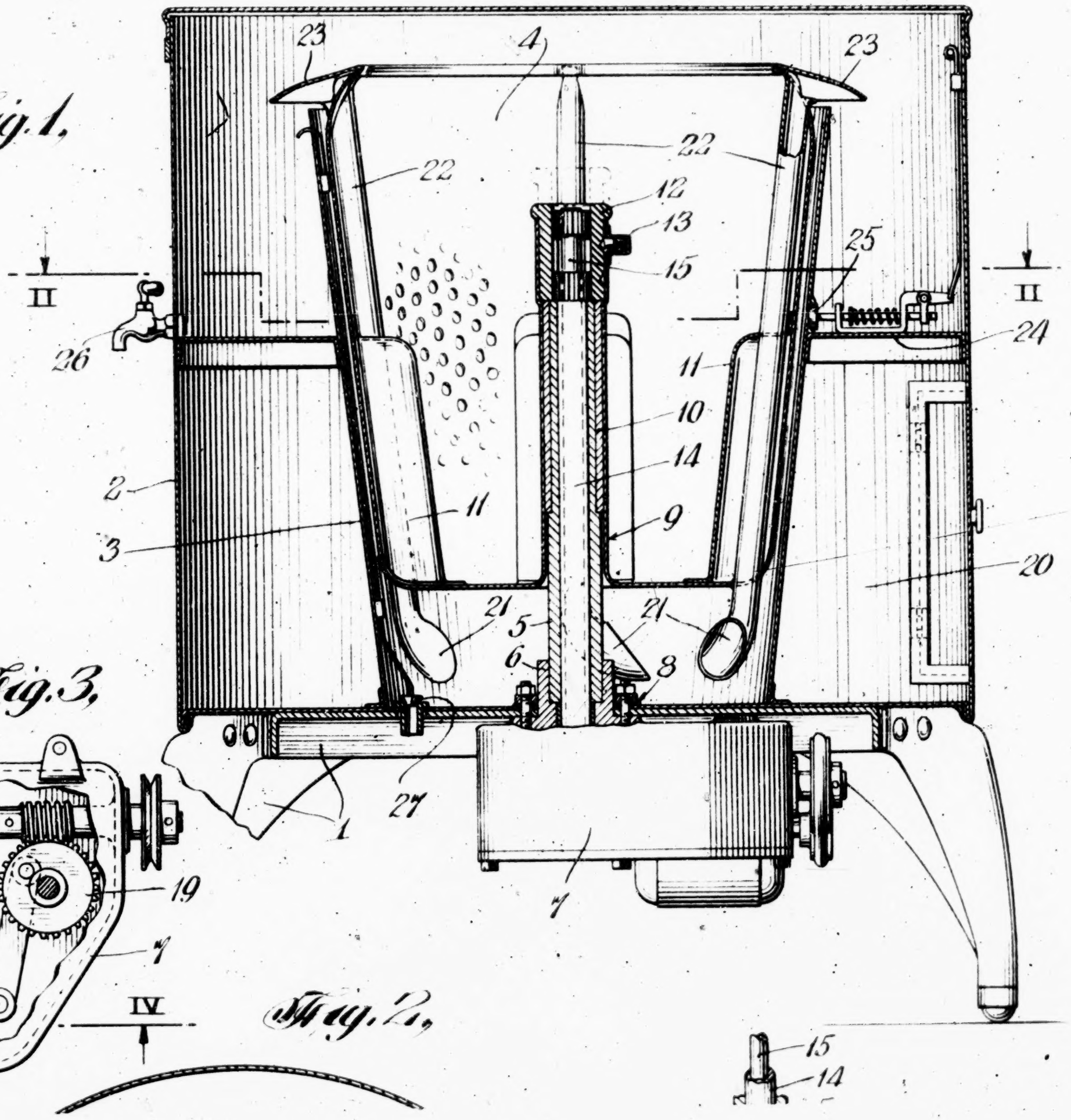


Fig. 3.

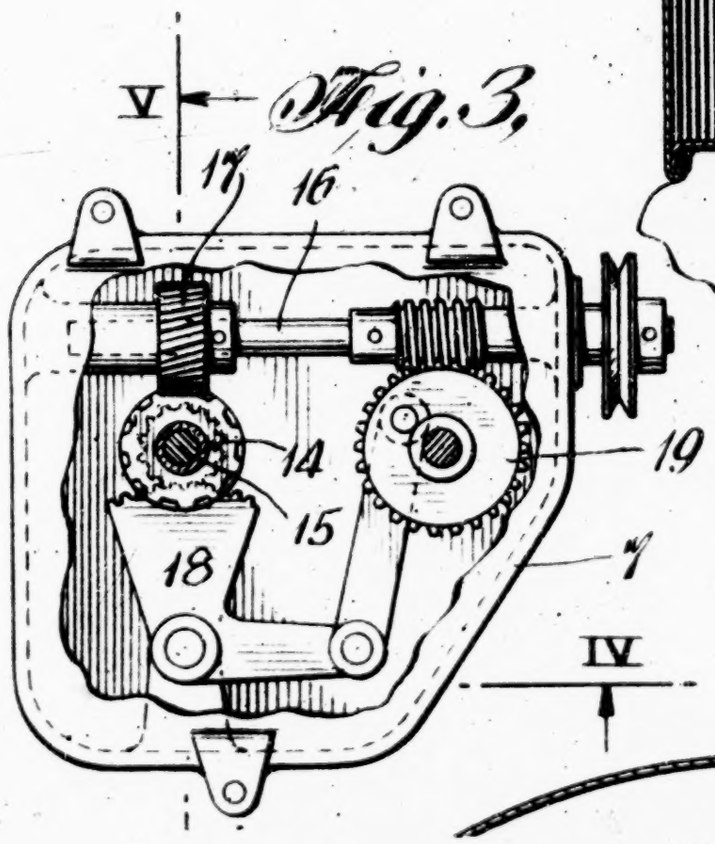


Fig. 2.

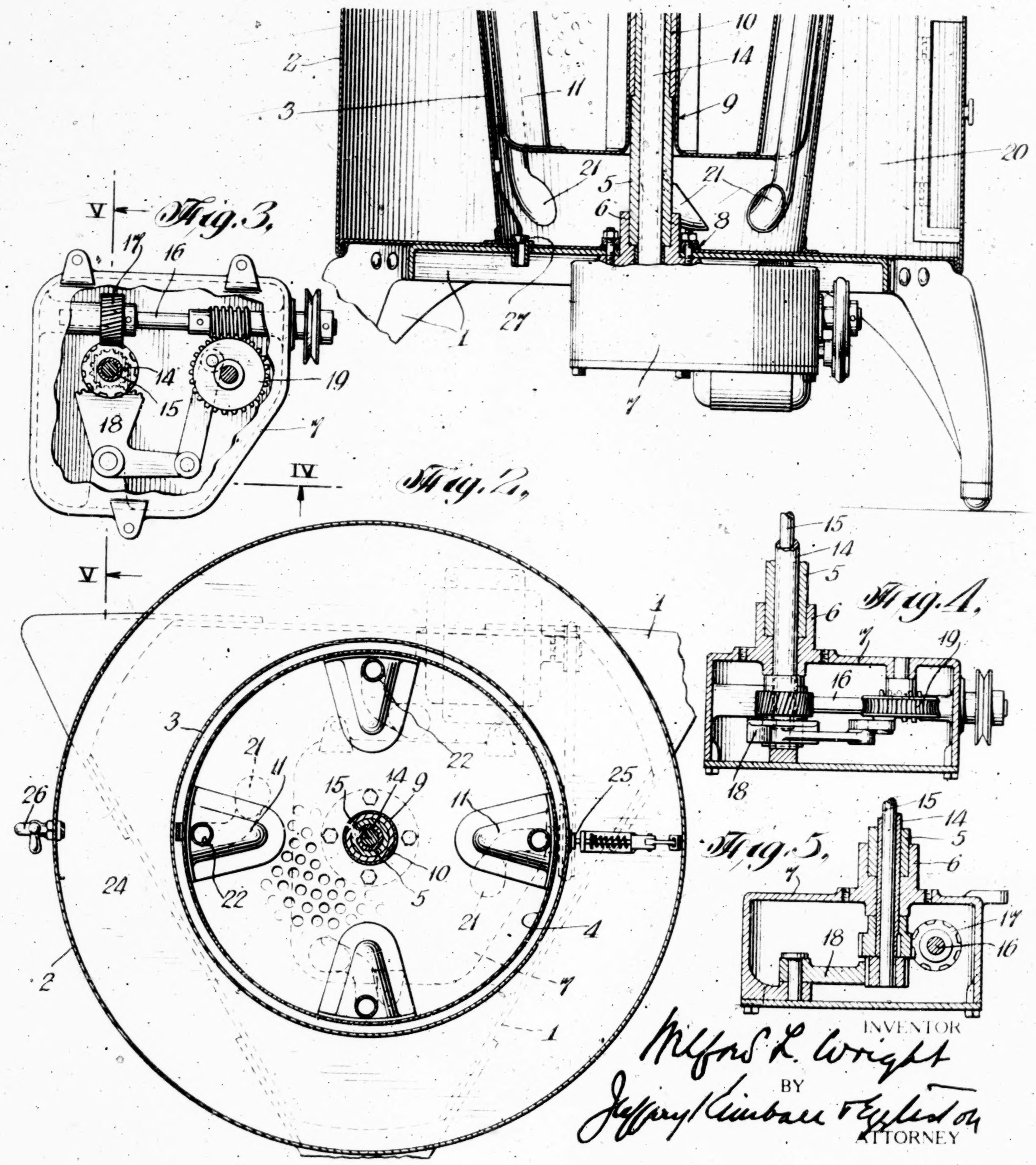


Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

INVENTOR
Milford L. Wright
BY
Jeffery, Kimball & Eyerdam
ATTORNEY

Patented Mar. 22, 1932 **1,850,821**

UNITED STATES PATENT OFFICE

WILFRED L. WRIGHT, OF HEMPSTEAD, NEW YORK, ASSIGNOR TO SAVAGE ARMS CORPORATION, OF UTICA, NEW YORK, A CORPORATION OF DELAWARE

WASHING MACHINE

Application filed July 30, 1926. Serial No. 125,880.

The invention relates to washing machines of the kind in which the clothes or other articles are washed and centrifugally dried in the same container or spinner, and its object is to simplify the mechanism necessary for these purposes so as to reduce the cost of manufacture and provide other advantages made apparent below.

The accompanying drawings illustrate more or less diagrammatically a washing machine embodying and thereby illustrating the principles of this invention.

Figure 1 is a longitudinal vertical section with parts in elevation;

Figure 2 is a cross-section on line II—II of Fig. 1;

Figure 3 a top plan of the gear box with the top wall broken out to show the motion;

Figure 4 an elevation of the gearing partly in section on the line IV of Fig. 3, and Fig. 5 a further sectional view on the line V—V of Fig. 3.

The machine comprises a base structure 1 including legs or other supporting means and a tank superstructure mounted thereon and comprising a main tank 2 of any suitable shape but preferably cylindrical, and an inner tank 3, which may be conical and which is desirably concentric to the outer tank.

The clothes container or spinner 4 occupies the inner tank, being rotatably mounted therein on an upstanding tubular post 5, which is rigidly held by a boss 6 fixed in the bottom of the tank. This boss is formed as part of the gear box 7, which is rigidly bolted to the base structure below the tank bottom and projects through the bottom with suitable provision against leakage such as a gasket 8 or otherwise; the upper end of the tubular post 5 is above the normal water level so that water does not enter it.

The spinner is provided with a central hub tube 9 extending, water-tight, from its bottom to a point also above the normal water level therein and this tube is internally provided with a bearing bushing 10 arranged to rotate on a shoulder formed on the base post 5, thus adapting the spinner to rotate within the inner tank, but any other type of bearing upon the post could be made to suffice.

The particular shape or design of the spinner is not material and it may conform to the shape of the inner tank, in which it rotates, but its upper edge is desirably turned inwardly or flanged so that the water therein will not splash out of the machine. The walls of the spinner are perforated, so that the water placed in tank 3 may enter it freely during the washing process and leave it freely during the drying process. The clothes are washed in this spinner, and after washing are also dried therein by rotating or spinning it at a sufficient velocity, say 550 or 600 R. P. M. For the washing process the spinner may be furnished with any known or appropriate means to forge the water repeatedly through the fabric of the clothes, which constitutes washing. One such means, preferred because of its simplicity, consists of one or more radial paddles 11 affixed to the side wall of the spinner, combined with some appropriate gearing for oscillating the spinner back and forth. This swashes the clothes back and forth through the water and washes them.

Such oscillating washing motion and also the continuous higher speed rotation, are imparted to the spinner through the base post 5 which is hollow for this purpose. The upper end of the hub tube of the spinner carries a manually adjusted clutch device 12, keyed or splined thereto and adapted to hold two positions thereon, in each of which it is held by a spring detent 13 or equivalent holding means. In its lower position (Fig. 1) it connects the spinner to the upper, multi-keyed end of a tubular shaft or sleeve 14, by which the spinner is driven continuously at the high speed requisite for centrifugal drying; in its upper position the clutch connects the spinner to the similarly multi-keyed end of an inner shaft 15, journalled within the sleeve 14, and by means of this shaft the spinner is oscillated. The drive sleeve 14 and its interior shaft 15 receive their respective motions from a horizontal drive shaft 16 journalled in the gear box 7. The lower end of the sleeve 14 is driven direct from the drive shaft by skew gear 17 and the lower end of the oscillating shaft 15 is driven by a pinion and segment

rack 18, which latter is oscillated by a rod connection to a worm wheel 19 driven at slower speed by a worm on the drive shaft. The gear box is also an oil container for the gearing referred to; the drive shaft extends outside of it, where it is provided with a sheave driven by belt or otherwise from an electric motor as indicated or other source of power.

After the clothes in the spinner have been sufficiently washed by the means described or any other appropriate means, the wash water is removed to and stored in the upper part of the annular space between the two tank walls and such removal is accomplished by the effect of the high speed rotation of the spinner itself, or of some part applied to or moving with it and without the need of separate pump mechanism requiring to be stopped and started as heretofore customary in washing machines. For this purpose the spinner in the present case, is provided with water-lifting means of such a type that it is not operative, or at least not effectively operative, by the oscillatory wash motion, but becomes operative when the speed is increased to or near that required for centrifugal drying. A simple, but by no means the only mechanism for producing this result consists of one or more scoops 21 fixed to or below the bottom of the spinner and respectively connected with riser conduits 22, which latter terminate under a deflector rim 23 formed on or attached to the spinner and extending toward or over the edge of tank 3. On high speed, the water in the inner tank is scooped up and delivered through the risers outwardly or against the deflector 23 and thence falls into the annular space referred to, while the clothes in the spinner are being dried by the centrifugal effect and as the water is discharged. The riser conduits 22 may be placed within the paddles when the latter are employed or may be otherwise arranged as preferred. The scoops remove enough water so that when the drying is finished the small quantity remaining will be well below the spinner bottom so as not to wet the centrifugally dried clothes.

The water storage space, between the tanks, is large enough to accommodate all of the wash water from the inner tank without utilizing the whole of the annular space between the two tank walls and accordingly the bottom wall 24 of such storage space may be located at a level the same as or slightly higher than the normal level of the wash water in the inner tank. When so placed the stored water may be returned by gravity to the inner washing tank merely by opening a valve or stopper such as 25, when if is desired to wash a second batch of clothes. A drain cock 26 may also be provided when it is desired to dispose of the wash water, and a similar drain or stopper may be provided for the inner tank, as indicated at 27, this being operated by a slide rod as indicated extending the run of the inner tank. The space 20 below the bottom 24 of the storage tank is provided with a door thus constituting a closed compartment for the storage of soap, bluing, etc.

Claims:

1. A combined washing and drying machine comprising a wash water tank, a clothes spinner therein, a motor, connections whereby the motor imparts motion to the spinner for washing the clothes therein, a discharge device for removing the water from said tank, connections whereby the motor imparts a second and different motion to the spinner for drying the clothes therein and means whereby the operation of the motor to impart said second motion and effect the drying of the clothes renders active said discharge device.

2. A combined washing and drying machine as claimed in claim 1 including a storage tank elevated above the wash water tank, connections whereby the discharge device discharges into the storage tank and a gravity return from the latter to the wash water tank.

3. A combined washing and drying machine comprising a wash water tank, a spinner therein adapted for both washing and drying the clothes, an elevated storage tank, a water elevating device, connections whereby the latter is operated by the spinner, during drying to transfer the water from the wash water tank to the storage tank and a valve controlled gravity return passage from the storage tank to the wash water tank.

4. A double-tank structure including a storage tank and a wash tank, a spinner located within the wash tank, drive mechanism operable to rotate the spinner at high speed to dry the contents thereof by centrifugal action, a water conveying device connected with said drive mechanism for operation coincidently with said high speed rotation of the spinner, said device arranged to receive water from said wash tank and provided with a discharge outlet to said storage tank, and manually controlled means operable to effect the return of the wash water from the storage tank to the wash tank.

5. The combination of a wash tank, a spinner therein having an outlet adapted to discharge water into said tank under centrifugal action, means for rotating the spinner at high speed to dry the contents thereof, an outer tank substantially enclosing the wash tank and spinner and of a size sufficient to accommodate all the wash water, and a water conveying device connected for operation coincidently with said high speed rotation of the spinner having an intake below the bottom thereof within the wash tank, said device having a discharge outlet to the outer tank.

6. A washing and drying machine comprising a wash tank, a spinner therein hav-

ing an outlet adapted to discharge water into said tank under centrifugal action, mechanism operable to effect the washing of clothes carried in said spinner, a water conveying device having an intake within the wash tank adjacent the bottom thereof and a discharge outlet to the exterior of the tank, drive mechanism for the spinner adapted to rotate the same at high speed to eject the liquid content thereof, said device connected with and driven by said drive mechanism and a control member operable in one direction to render effective said first mentioned mechanism and in another direction to render effective both said water conveying device and said high speed spinner rotation.

7. A combined washing and drying machine comprising a tank for the wash water, a clothes spinner therein, an elevated storage tank, a scoop-type water elevating device carried by the spinner and active in response to relatively high speed rotation thereof, an outlet from said device into the storage tank, and driving means for the spinner arranged to oscillate the same to wash the clothes and alternatively to effect said relatively high speed rotation to simultaneously transfer the wash water from the first mentioned tank to the storage tank and dry the clothes.

In testimony whereof, I have signed this specification.

WILFRED L. WRIGHT.

March 16, 1943. J. B. DYER 2,313,928

DOMESTIC APPLIANCE

Filed April 24, 1939 8 Sheets-Sheet 1

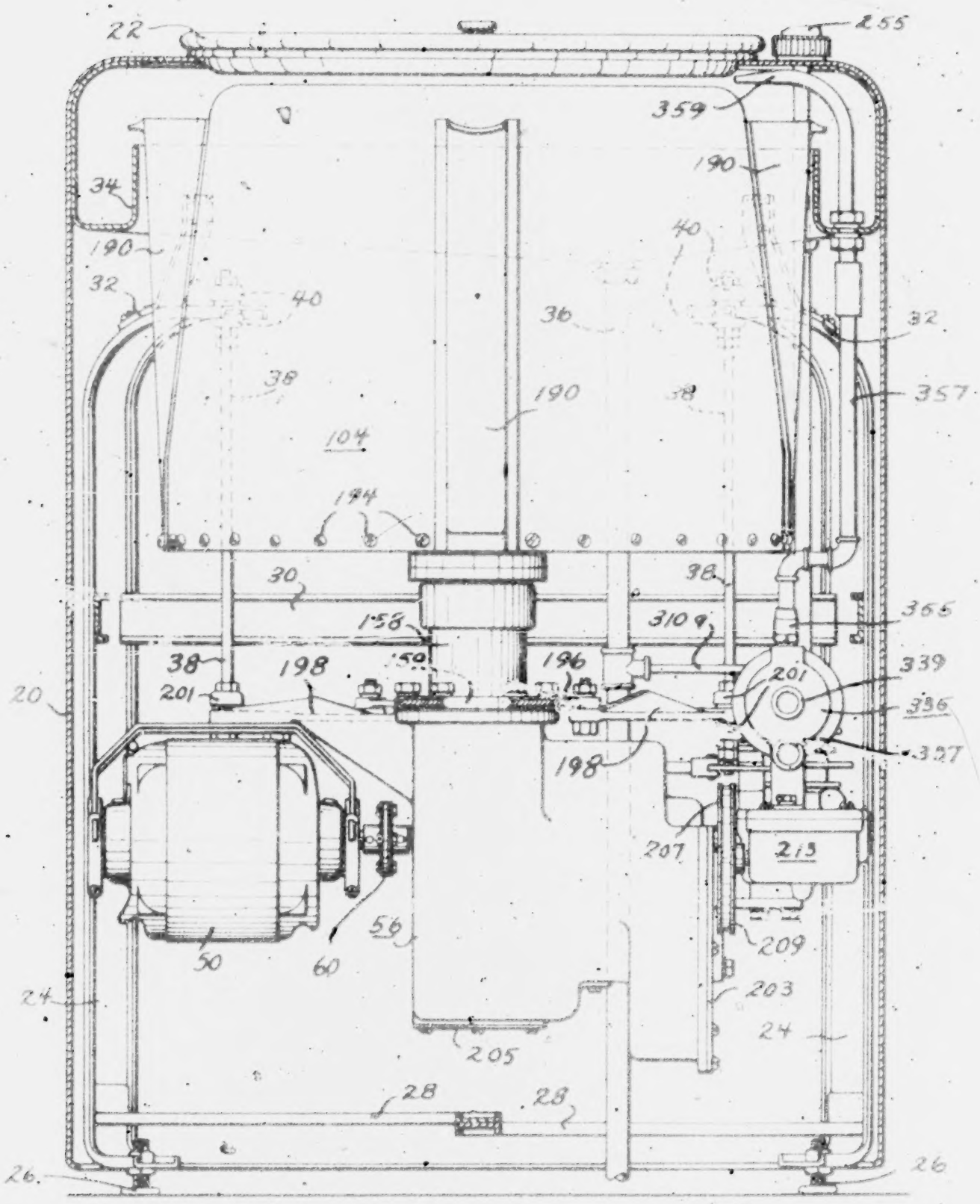


Fig. 1

INVENTOR
BY John B Dyer
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DOMESTIC APPLIANCE

Filed April 24, 1939 8 Sheets-Sheet 2

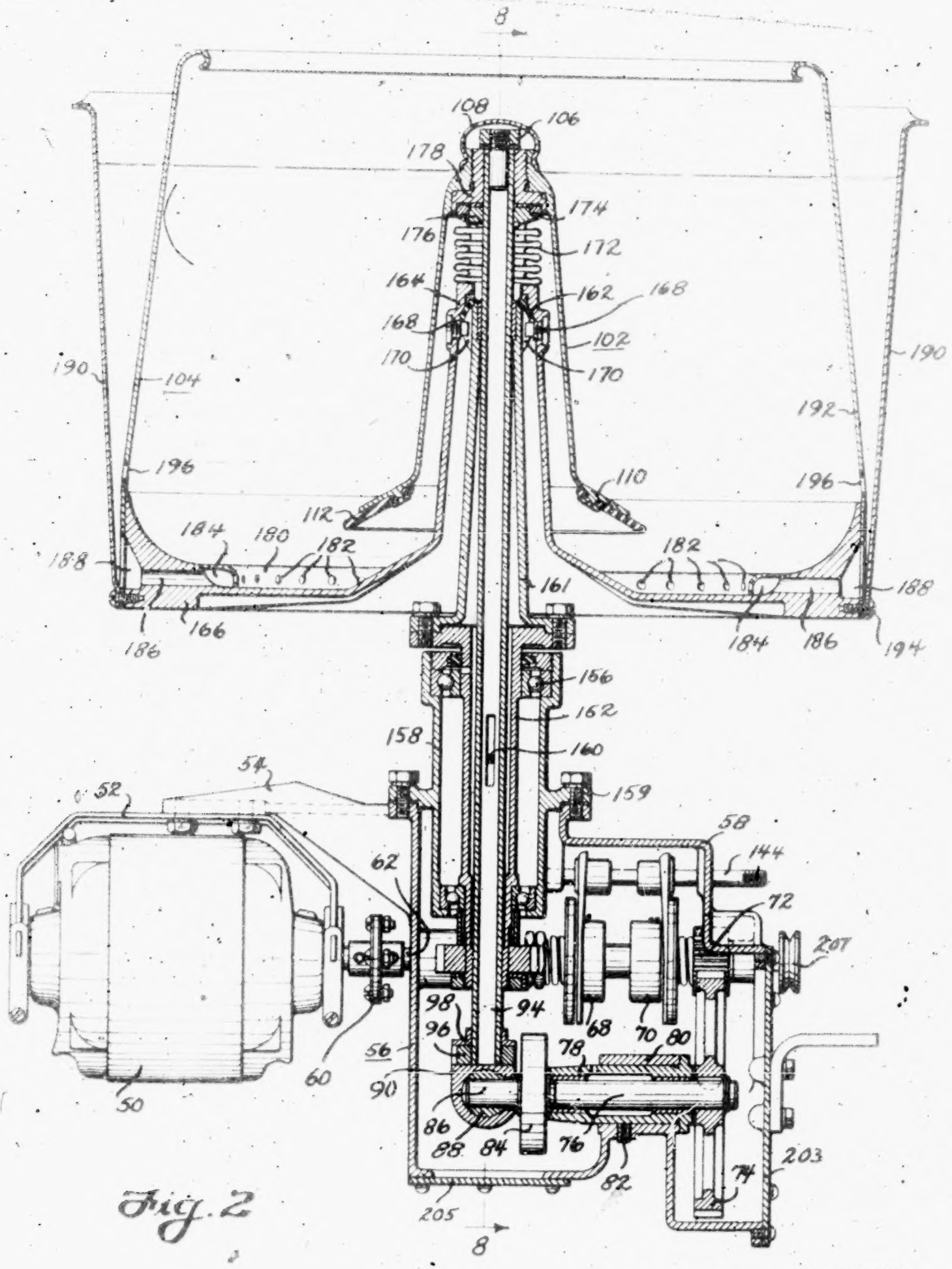

Fig. 2

INVENTOR.

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DOMESTIC APPLIANCE

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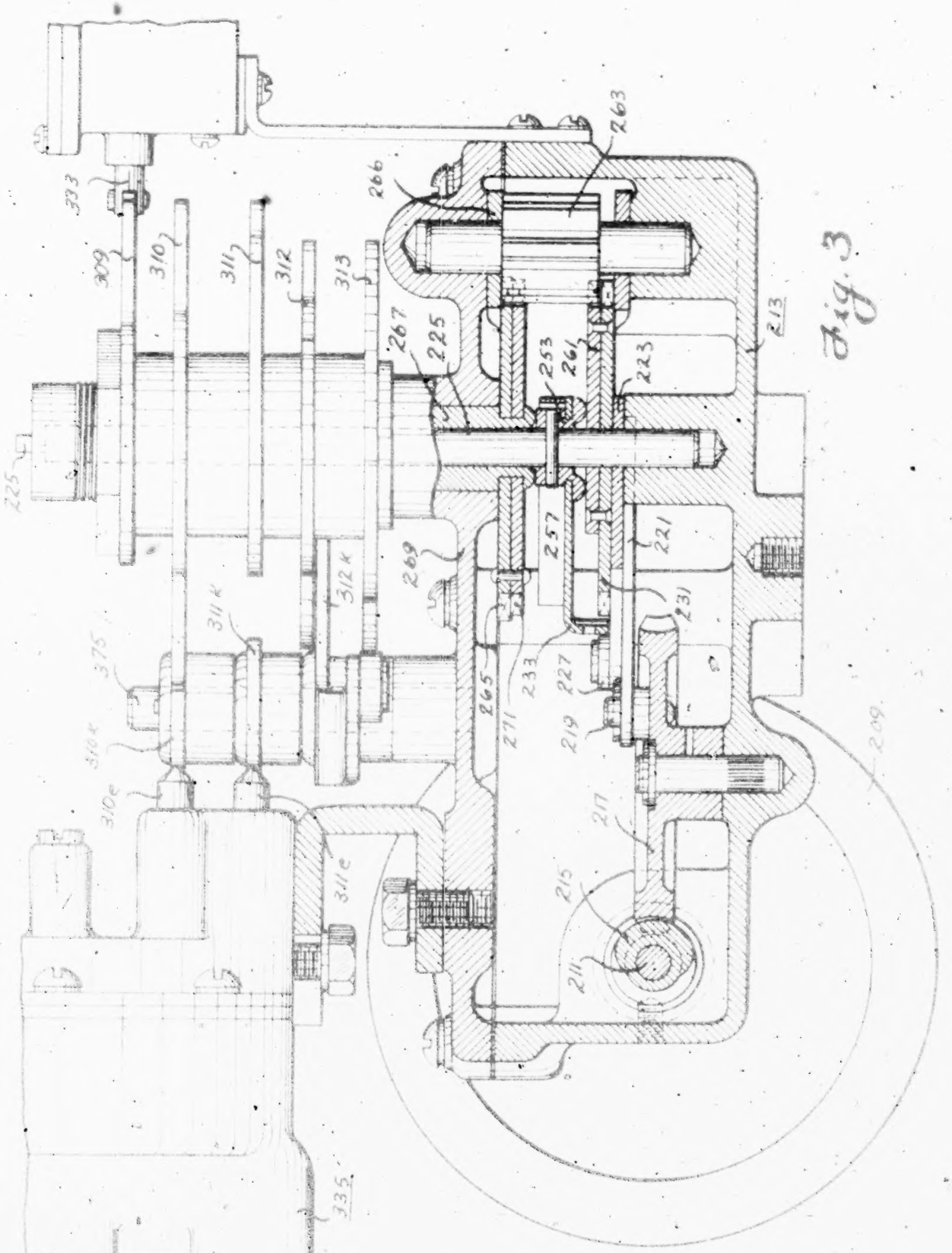

Fig. 3.

INVENTOR.
BY John B. Dyer
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March 16, 1943. J. B. DYER 2,313,928

DOMESTIC APPLIANCE

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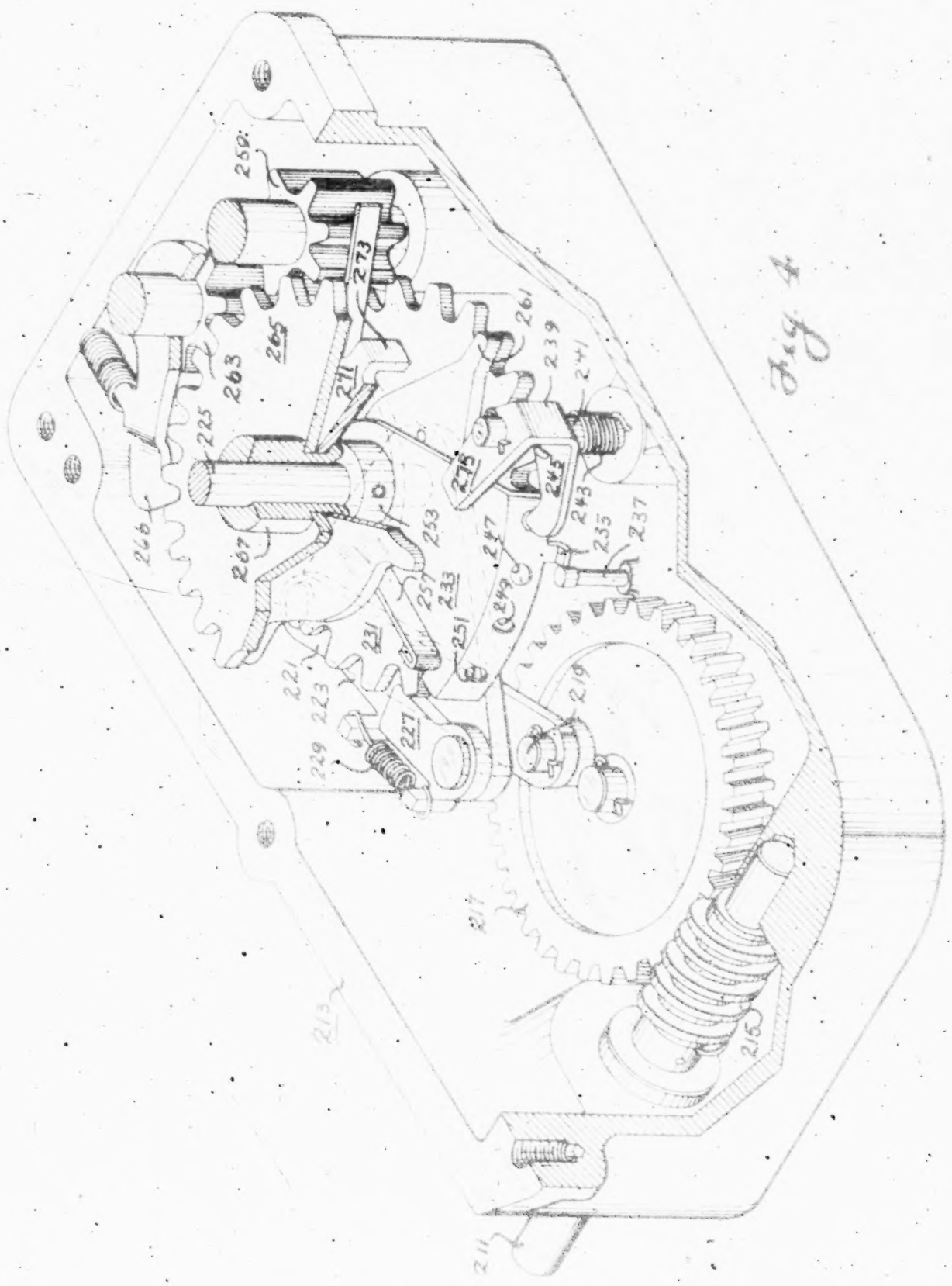

Fig. 4

INVENTOR
John B. Dyer
By Spencer Hardman and Fehr
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March 16, 1943. J. B. DYER 2,313,928

DOMESTIC APPLIANCE

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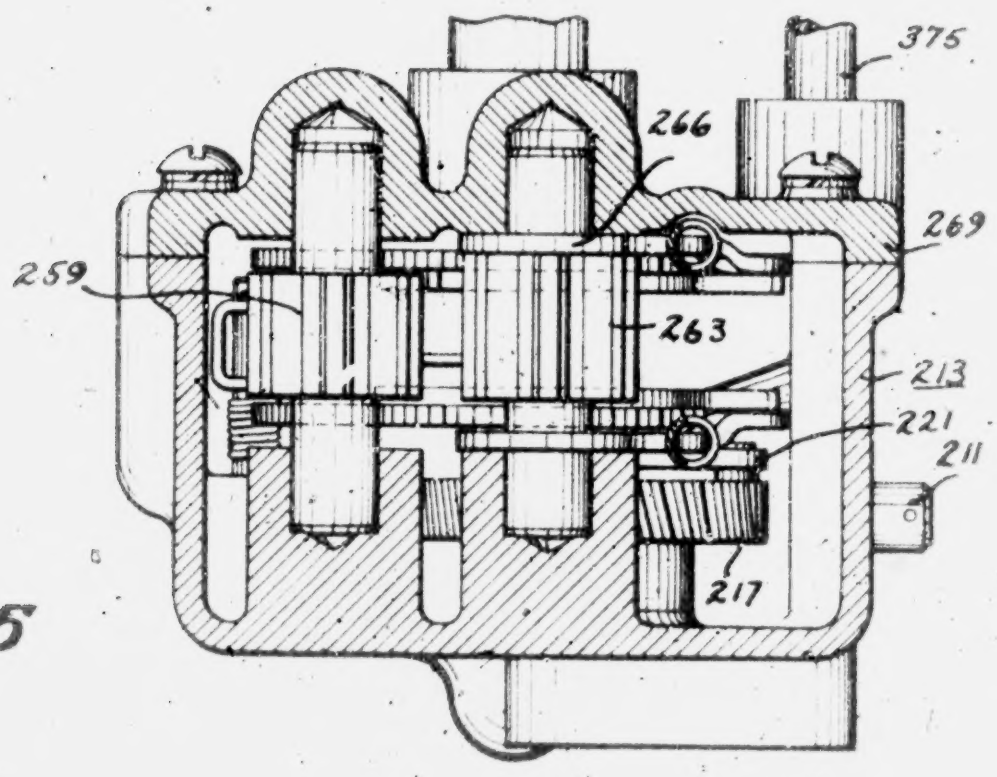

Fig. 5

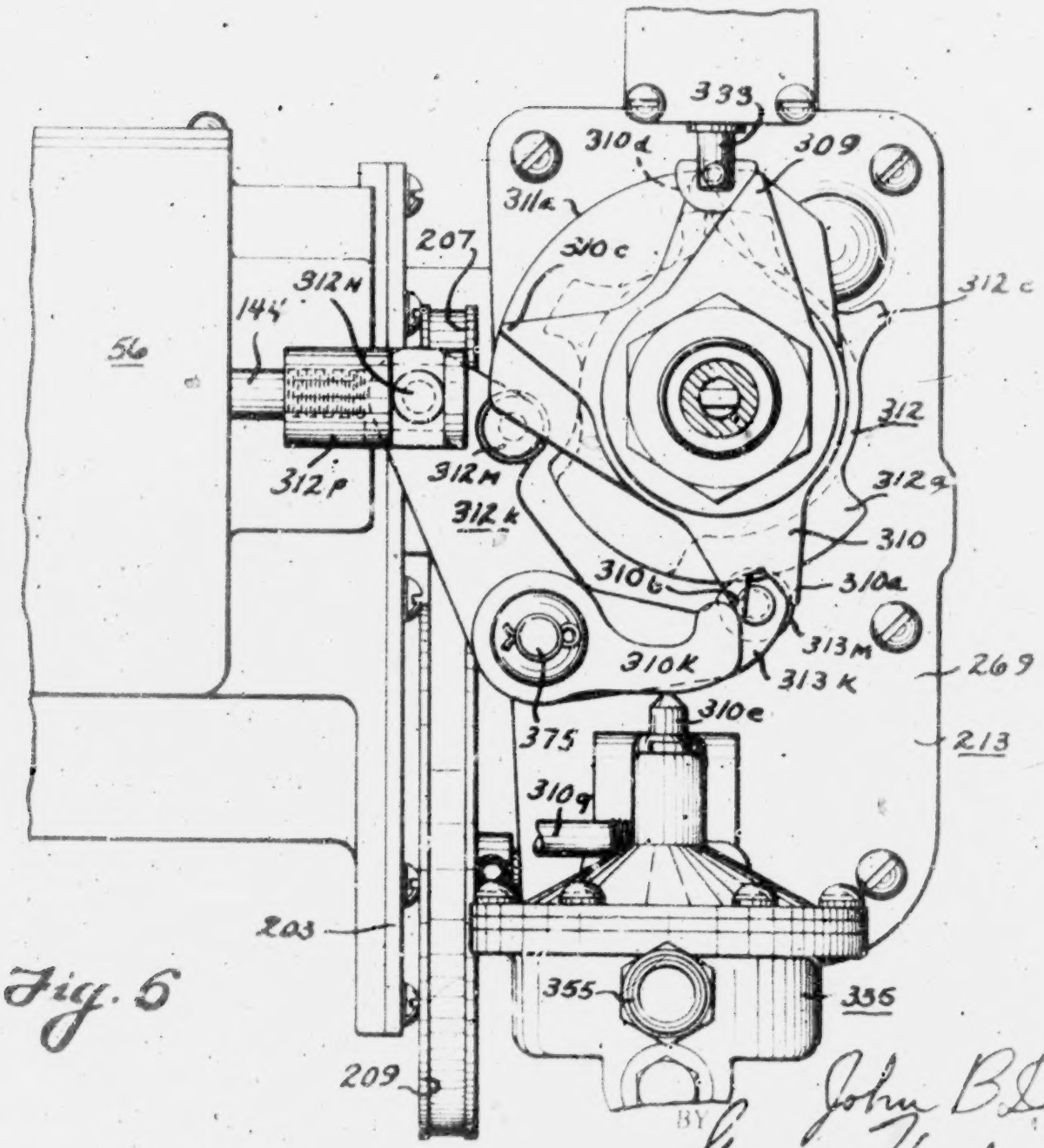

Fig. 6

INVENTOR
John B. Dyer
BY Spencer Hardman and Fehr
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March 16, 1943. J. B. DYER **2,313,928**

DOMESTIC APPLIANCE

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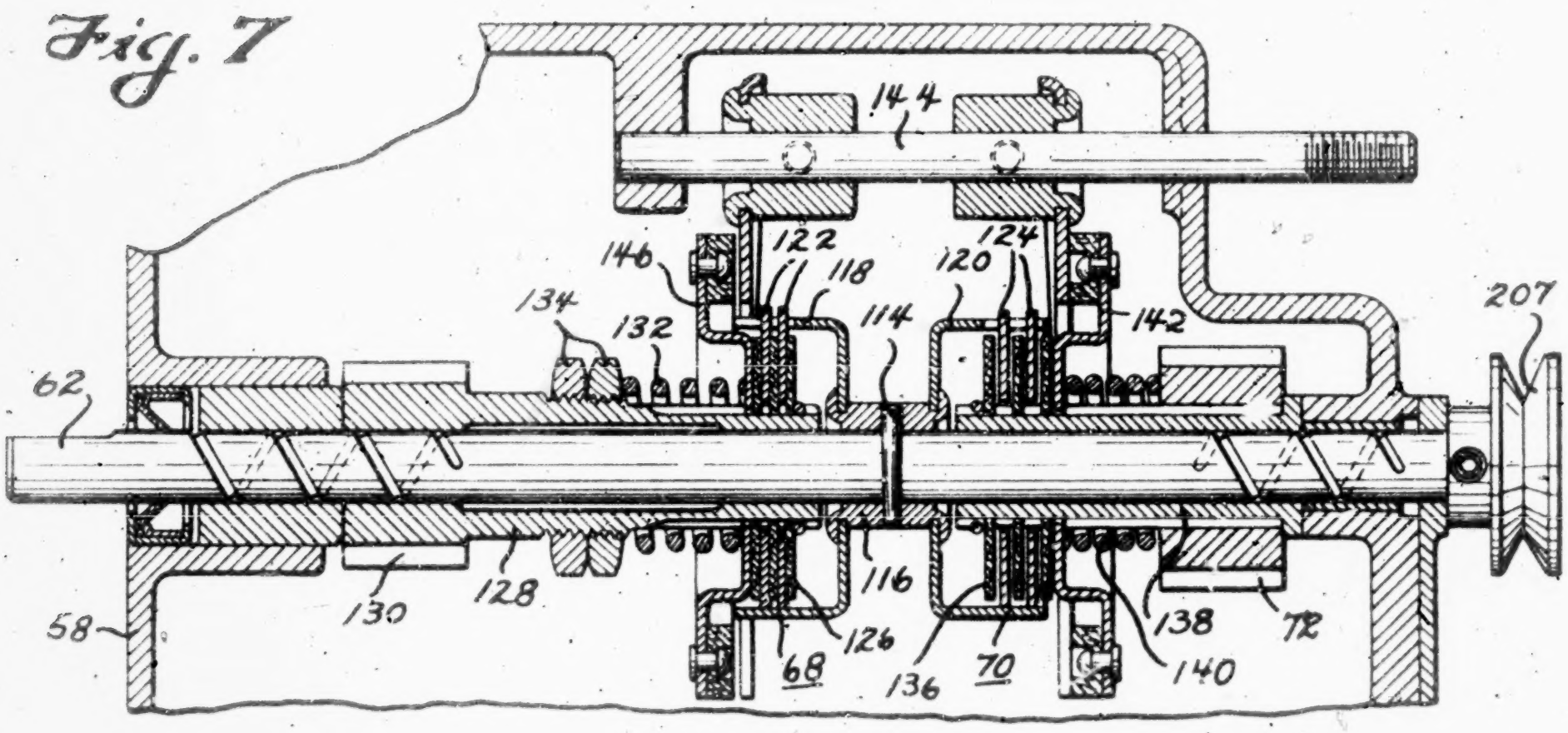
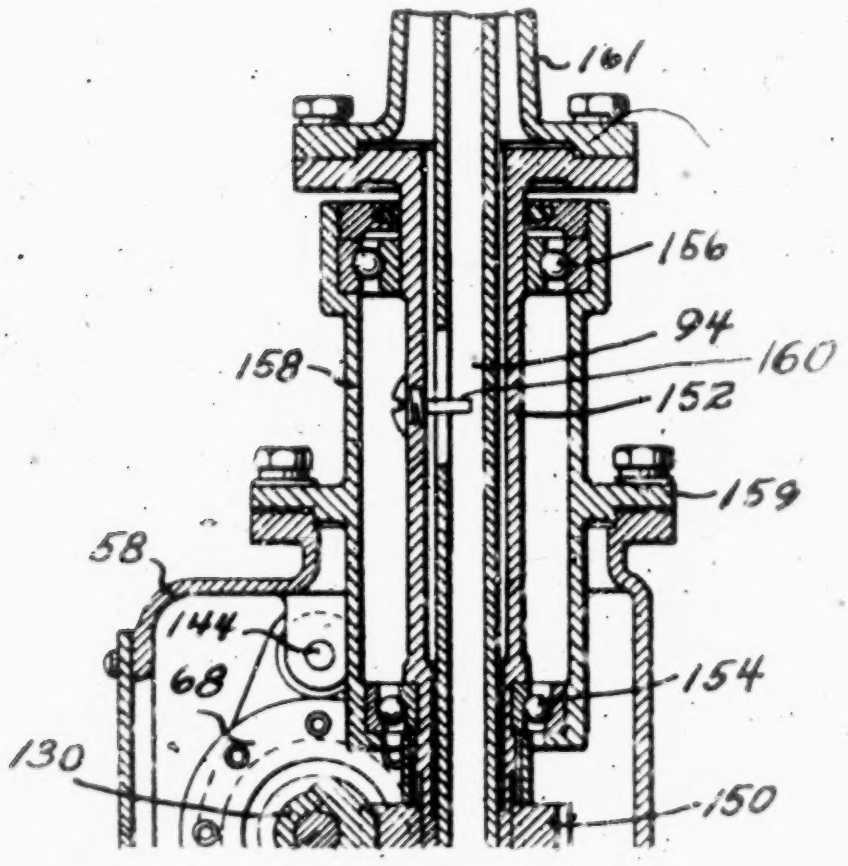
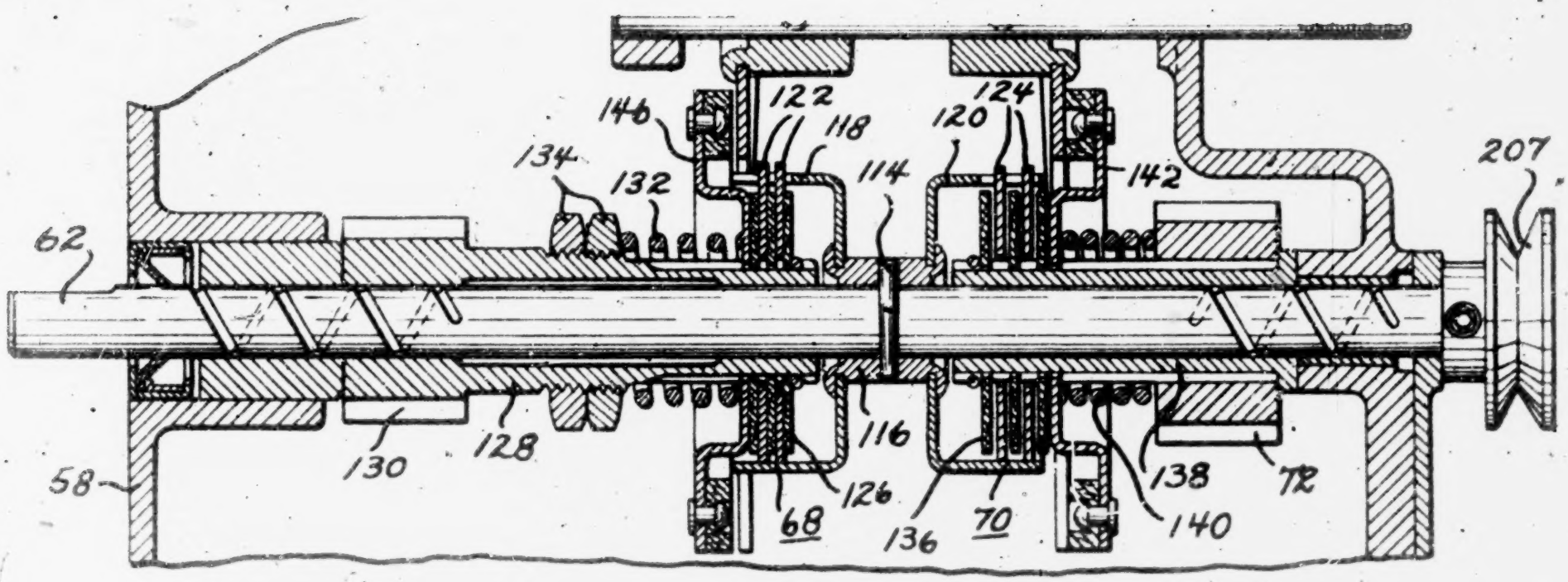
Fig. 7







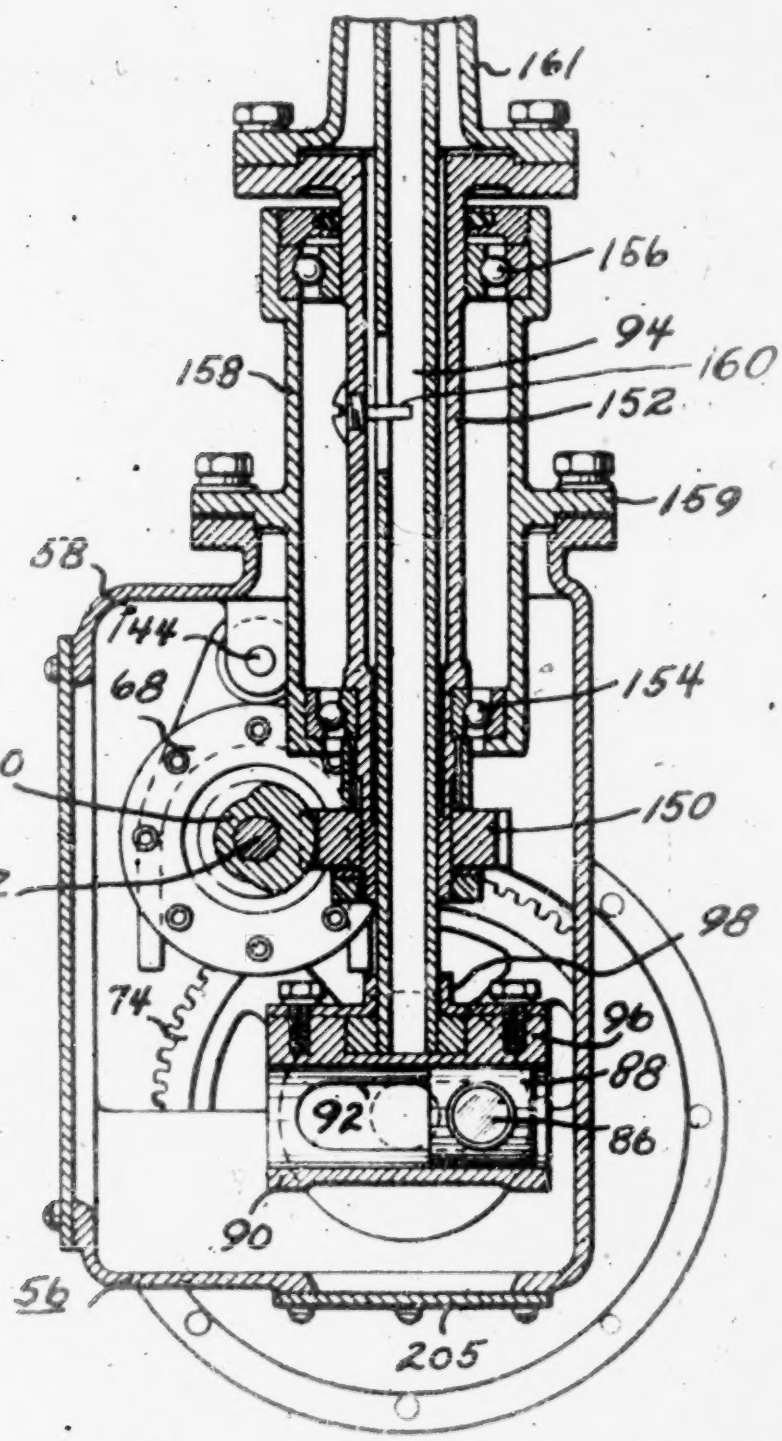


Fig. 8

INVENTOR
BY John B Dyer
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March 16, 1943. J. B. DYER 2,313,928

DOMESTIC APPLIANCE

Filed April 24, 1939 8 Sheets-Sheet 7

Fig. 9

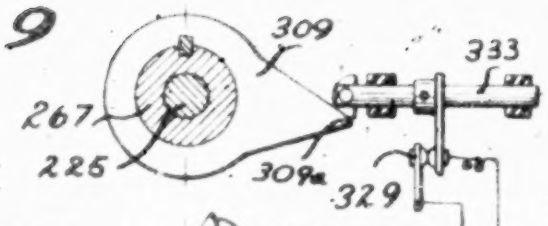


Fig. 10

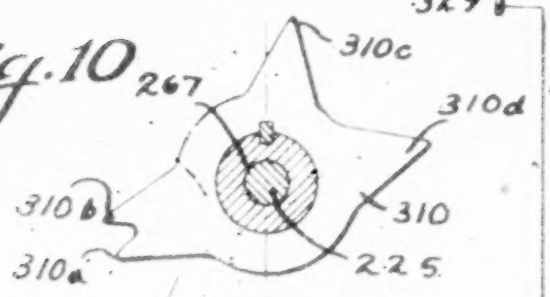


Fig. 11

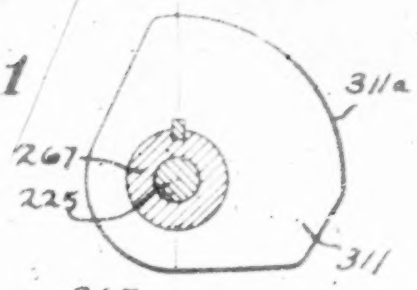


Fig. 12

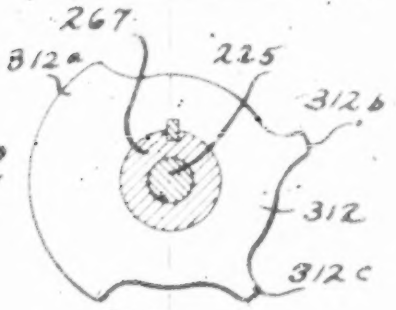
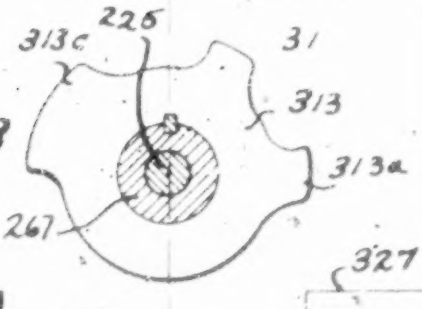


Fig. 13



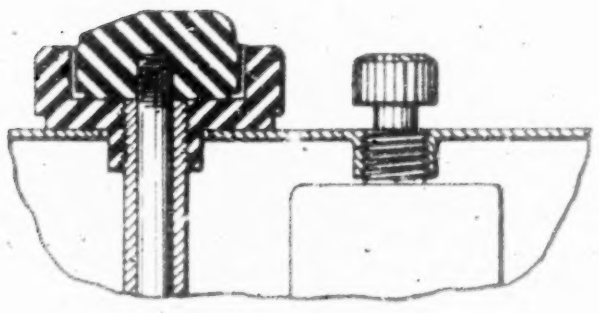


Fig. 14

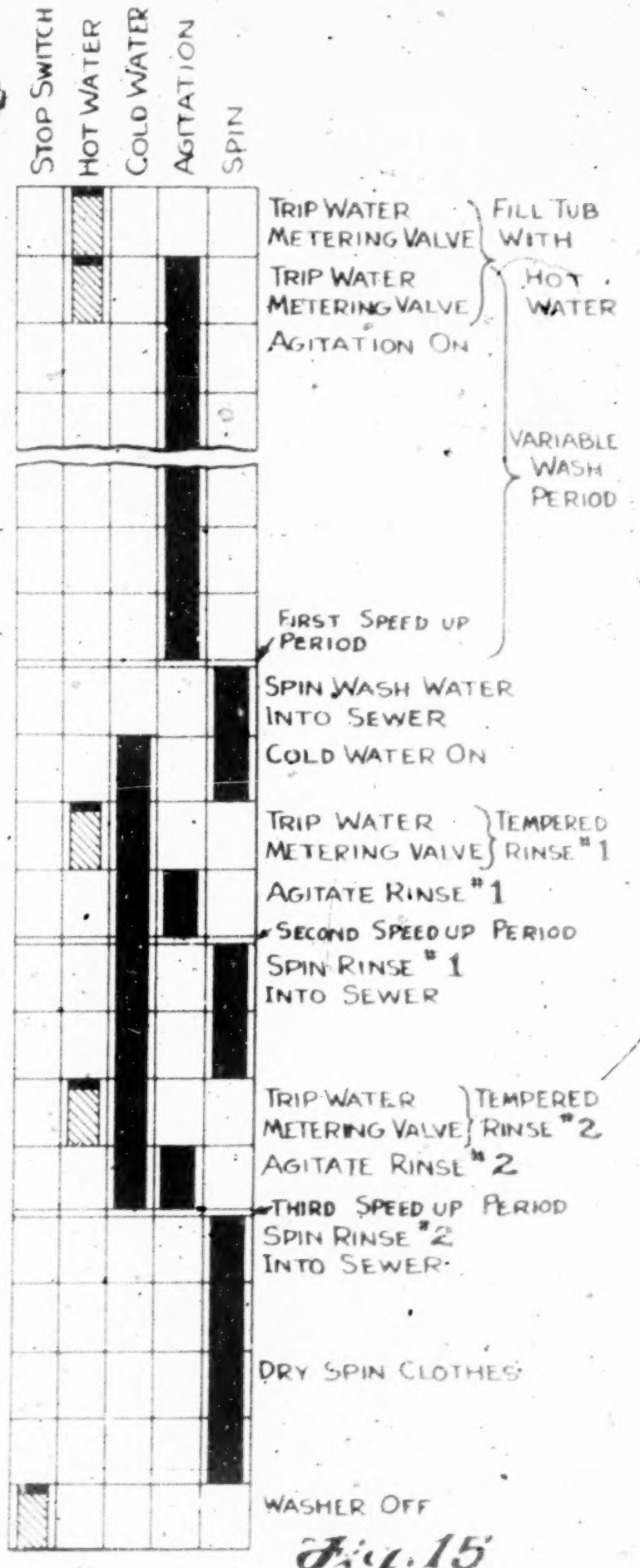


Fig. 15

INVENTOR
John B. Dyer
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March 16, 1943. J. B. DYER 2,313,928

DOMESTIC APPLIANCE

Filed April 24, 1939 8 Sheets-Sheet 8

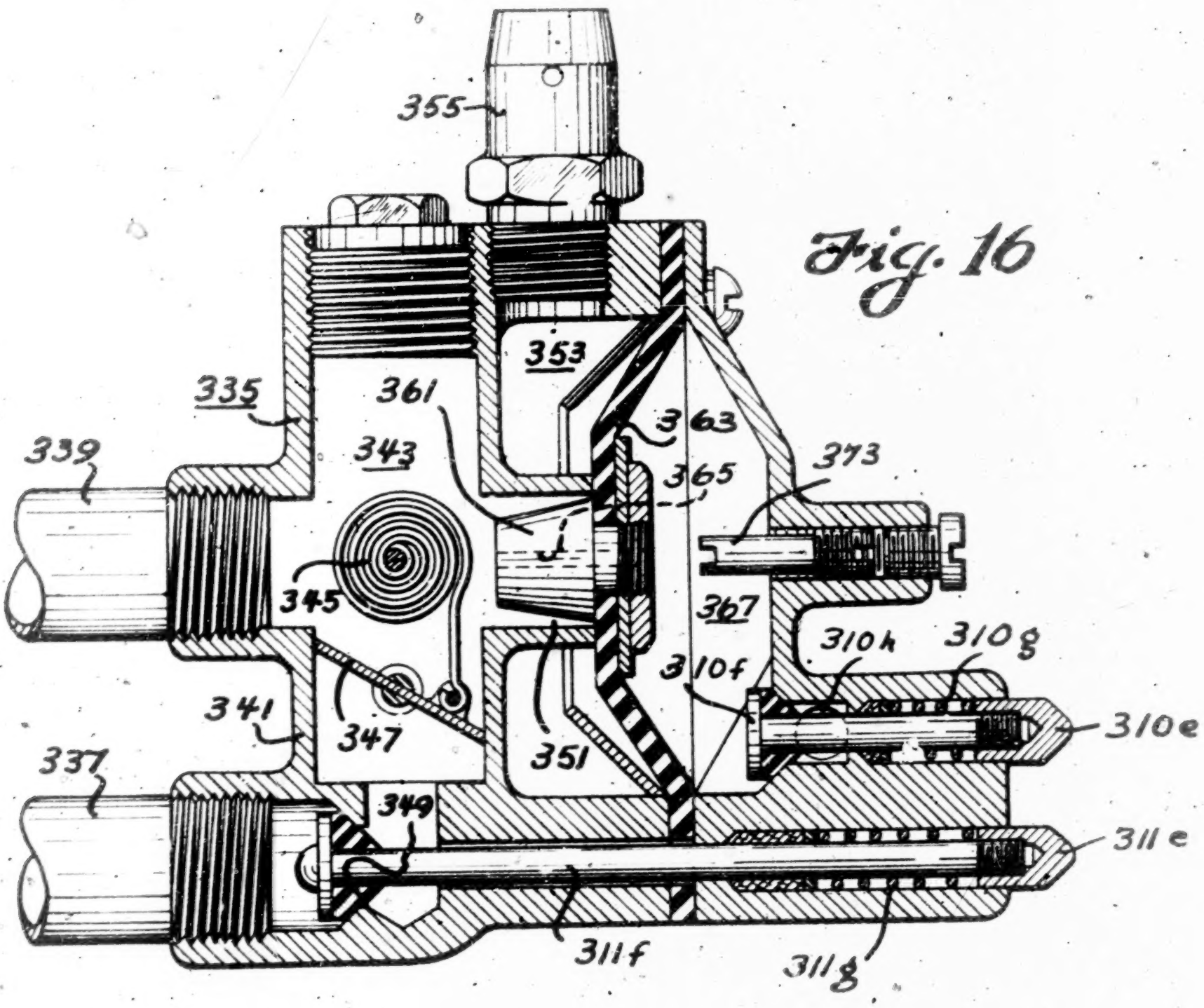

Fig. 16

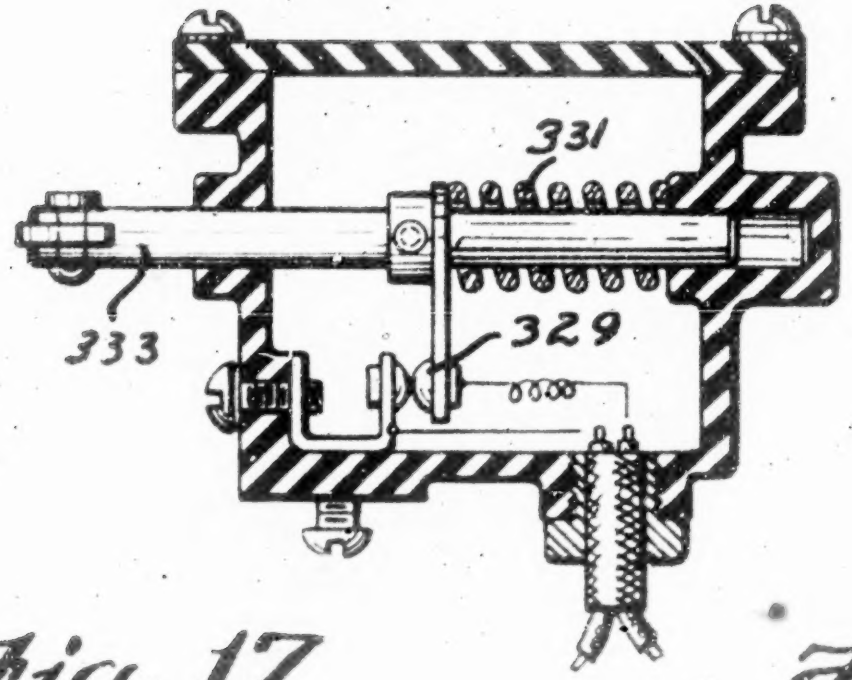

Fig. 17

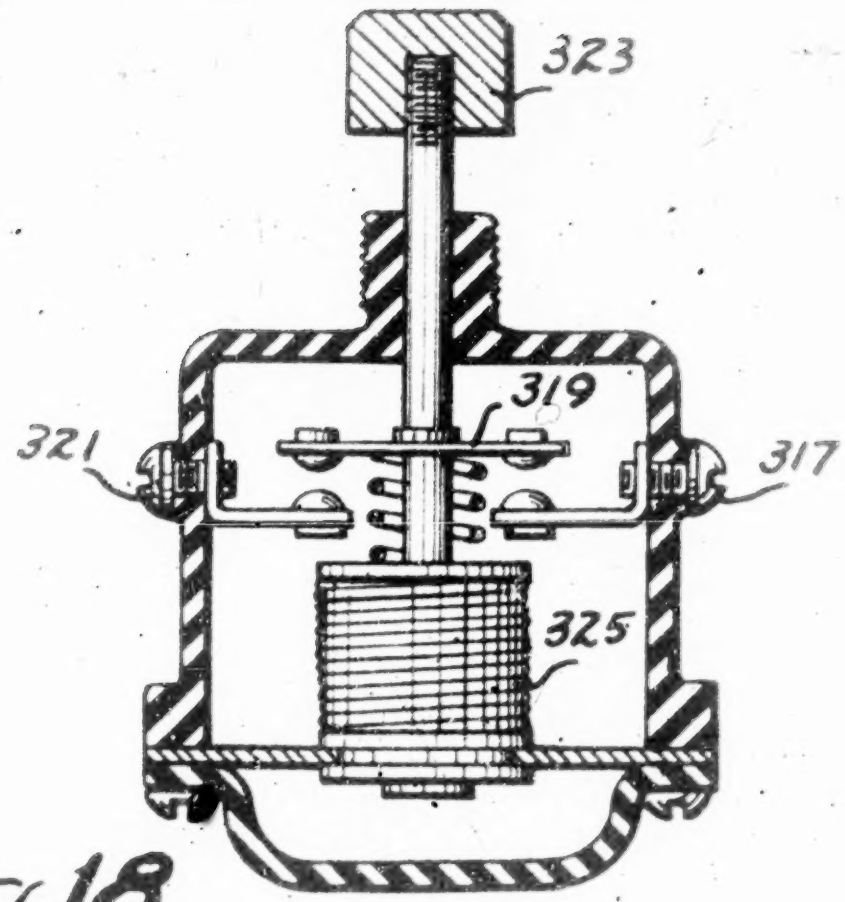

Fig. 18

INVENTOR.
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BY Spencer Hardman and Fehr
ATTORNEYS

Patented Mar. 16, 1943

Defendant's Exhibit D.

2,313,928

UNITED STATES PATENT OFFICE

2,313,928

DOMESTIC APPLIANCE

John B. Dyer, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application April 24, 1939, Serial No. 269,594

6 Claims. (Cl. 68—23)

This invention relates to a domestic appliance and more particularly to automatic washing machines and centrifugal rinsing and drying machines.

The natural progress of the art dictates an automatic washing machine. From a practical standpoint, simplicity of design and operation dictates a single receptacle type of washing machine. Previous attempts to provide such a type of washing machine developed structures which had bad vibration characteristics under certain conditions causing a lack of durability and reliability as well as other customer objections.

It is an object of my invention to provide an improved durable and reliable washing machine of the single receptacle type which is simple in design, neat in appearance, and balanced so as to avoid excessive vibrations under any reasonable conditions.

My improved washer employs a centrifugal rinsing and drying mechanism. I have found that such mechanism in disposing of the water in the manner heretofore performed tends to leave suds on the clothes and fails to remove sand and dirt from the receptacle.

It is an object of my invention to so remove water from the centrifugal rinsing and drying mechanism as to prevent contact between the suds and the clothes in removing water from the receptacle and especially to prevent the deposit of the suds on the clothes.

It is another object of my invention to remove by the water withdrawn from the receptacle, sand, dirt and other particles which tend to remain in suspension in the water.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a view in elevation with the casing in section of one form of an automatic washing machine embodying my invention;

Fig. 2 is a vertical sectional view of the mechanism shown in Fig. 1;

Fig. 3 is a view partly in elevation and partly in section of the control mechanism shown on the right side of Fig. 1;

Fig. 4 is an isometric view of the gear case shown in Fig. 3;

Fig. 5 is a sectional view of the far end of the gear case shown in Fig. 4;

Fig. 6 is a top view of the control mechanism shown in Fig. 3;

Fig. 7 is an enlarged sectional view of the clutch mechanism shown in Fig. 2;

Fig. 8 is a sectional view of a portion of the spinning and agitating mechanism taken along the line 8—8 of Fig. 2;

Fig. 9 shows the stop cam together with the switch mechanism which it controls and the wiring diagram of the washing machine;

Fig. 10 is a view of the cam for the water metering valve.

Fig. 11 is a view of the cold water control cam;

Fig. 12 is a view of the agitation control cam;

Fig. 13 is a view of the spinning control cam;

Fig. 14 shows the control knobs and shafts as well as the solenoid control for starting and stopping the machine, and for controlling and setting the variable wash period;

Fig. 15 is a diagram illustrating the actuating periods of the various cams;

Fig. 16 is a sectional view of the water metering and water tempering valve shown at the right in Fig. 1;

Fig. 17 is a sectional view of the switch mechanism actuated by the cam in Fig. 9; and

Fig. 18 is a sectional view of the solenoid and manually controlled switch shown diagrammatically in Fig. 9 and shown in elevation in Fig. 14.

Briefly, I have shown an automatic washer which consecutively supplies hot water, agitates, supplies rinsing water, rinses and dries the clothes and finally shuts off automatically. The washer is provided with a balanced tub and floating driving and supporting mechanism. The agitator within the tub is reciprocated vertically by a Scotch yoke drive which is located beneath the tub and drives the agitator through a shaft in axial alignment with the tub. The rinsing and drying of the clothes is performed by spinning the tub through a driving mechanism which is coaxial with the agitator drive and the axis of the tub. The tub is provided with central outlets so that the suds will not be deposited upon the clothes upon removal of the water. The operation of the washer is controlled by cams driven by a step by step timing mechanism which in turn is driven by the main driving motor which also furnishes the drive through clutches for the agitating mechanism and the spinning of the tub.

Outer shell

Referring now to the drawings, there is shown in Fig. 1 an outer sheet metal shell 20, closed at the top by a lid 22, provided with four vertical

inner frame members 24, having adjustable gliders 26 at their lower ends. These vertical frame members 24 are held in position at their lower ends by diagonal frame members 28 and at their mid-portion by arc-shaped frame members 30 which follow the contour of the outer shell 20. The upper ends of the frame members 24 are provided with brackets 32 which support a collecting trough 34 formed on the inside of the in-turned flange at the top of the outer shell 20. The collecting trough 34 is provided with a drain which includes the downwardly extending pipe 36 which connects to the sewer or other form of waste water disposal. The frame members 24 at their upper ends are bent inwardly to support the upper ends of floating supporting rods 38 for supporting of the moving parts of the washing machine. These rods are provided with thick, soft rubber vibration absorbing washers 40 on either side of the in-turned upper ends of the frame members 24. These washers are held in position by nuts threaded onto the upper ends of the rods 38.

Driving mechanism

The main moving parts of the washer are better shown in Figs. 2, 7 and 8, and include the main driving motor 50 which is supported by rubber mountings at either end. These mountings are provided upon the lower ends of an inverted U-shaped bracket member 52 which in turn is fastened to the arm 54 of a main casting 56 which includes a portion forming a crankcase 58. The main driving motor 50 has its shaft connected by a flexible coupling 60 to a clutch shaft 62 supported by the bearings 64 and 66 which are provided in opposite sides of the crankcase 58.

The agitator drive mechanism

The clutch shaft 62 (Fig. 7) is provided with a spinning clutch 68 for spinning the tub and a clutch 70 which connects the clutch shaft 62 to a pinion 72 which in turn drives a larger gear 74 keyed to one end of the shaft 76. The shaft 76 is rotatably mounted in a double bearing sleeve 78 which in turn is fixed within a bearing support 80 and held in position by a set screw 82. The sleeve 78 is provided with a shoulder at the end nearest the gear 74 which engages the adjacent end of the bearing support 80 in order to properly locate the sleeve 78.

The shaft 76 at the end opposite the gear 74 is provided with a heavy metal disc 84 having a crankpin 86 which extends into the piston shaped slide member 88 of a Scotch yoke drive mechanism. The slide member 88 is received within a cylindrical member 90 formed with a slot 92 for receiving the crankpin 86. This cylindrical member 90 is connected to the lower end of agitator shaft 94. The crankcase 58 is provided with a cover plate 203 by which the sleeve 78 may be withdrawn from the bearing support 80 after loosening the set screw 82 in order to remove drive pin 86 from the Scotch yoke drive. This will allow access to the agitator rod 94 which is made possible by the closure plate 205.

In order to permit the agitator shaft 94 to rotate, it is provided with a bearing member 96 at its lower end which is rotatively mounted in a recess provided in the top of the cylindrical member 90 by a flanged plate 98. The member 96 may be welded or otherwise fastened to the bottom of the agitator shaft 94 and is free to rotate within the recess beneath the flanged opening of the plate 98. The agitator shaft 94 extends vertically upwardly and its upper end is connected to a cone-shaped agitator 102 which is located within the tub 104. The agitator shaft 94 is hollow and is provided at its upper end with a stud upon which is threaded a clamping nut 106 for clamping the agitator hub 178 to the top of the shaft 94. The agitator 102 is threaded onto its hub 178 and has a sheet metal cap 108 providing a smooth crown for the top of the agitator 102 which covers the clamping nut 106. The agitator is somewhat in the form of a thimble and has a metal flange 110 at its lower end to which is riveted a heavy rubber flange 112.

When the driving motor 50 operates and the clutch 70 is engaged, the pinion 72 will drive the gear 74 to revolve the crankpin 86 of the Scotch yoke drive mechanism for reciprocating the agitator shaft 94 at the rate of several hundred times a minute. This agitation provides excellent washing of the clothes in the tub 104. The clothes have very little contact with the agitator or the sides and bottom of the tub so that the clothes are subjected to little wear and tear during the washing operation. For the washing operation the tub is filled to a level about the bottom of the cap 108. The construction of the clutch mechanism is better shown in Fig. 7.

The clutches

The clutches 68 and 70 are connected to the clutch shaft 62 by a tapered pin 114 which connects the sleeve 116 to the clutch shaft 62. Riveted to each end of the sleeve 116 are the cup-shaped driving members 118 and 120 which slidingly support the notched multiple disc driving plates 122 and 124 of the spinning and agitating clutches 68 and 70. The driven plates of the spinning clutch 68 are designated by the reference character 126 and are provided with toothed apertures receiving the splined sleeve 128 which is rotatably mounted upon the clutch 62 and is provided with the spinning helical gear 130 for spinning the tub.

When the spinning clutch is engaged as shown in Fig. 7, the driving and driven plates 122 and 126 are held together by a spring 132 which imposes a limited amount of tension upon the clutch plates so as to permit a slipping of the clutch at the start of the spinning operation in order to prevent too great a strain upon the driving mechanism or driving motor. This spring 132 is adjusted by the adjusting and lock nuts 134 which are threaded onto the sleeve 128. The agitating clutch 70 is also provided with driven clutch plates 136 provided with teeth engaging the splined end of the sleeve 138 which carries the agitator pinion 72. The sleeve 128 is provided with a flange for holding the agitator pinion 72 in place and the clutch spring 140 extends between the agitator pinion 72 and the clutch throw-out member 142 which is adapted to retract the spring 140 from the clutch plates 124 and 136 of the agitator clutch 70.

When the clutch throw-out member 142 so retracts the spring 140, the clutch 70 is disengaged. The clutch throw-out member 142 is fastened to and supported by the clutch operating rod 144 which also carries the clutch throw-out member 146 located between the clutch spring 132 and the clutch plates 122 and 126 of the spinning clutch 68. When the clutch rod 144 is moved to the right, as shown in Fig. 7, the clutch throw-out member 142 retracts the clutch spring 140 to disengage the agitator clutch 70 and the

agitator drive from the clutch shaft 62. In this position, however, the spinning clutch spring 132 is permitted to exert its limited tension upon the clutch plates of the spinning clutch 68 so that the helical gear 130 which spins the tub is connected through the clutch plates to the clutch shaft 62.

The spinning mechanism

The helical gear 130 meshes at right angles with a helical gear 150 mounted upon the lower end of a sleeve 152 which surrounds the agitator shaft 94. This sleeve 152 is supported by ball bearings 154 and 156 which in turn are supported by a cylindrical-shaped member 158 provided with a flange 159, by which it is fastened to the main casting 58.

The sleeve 152 is connected to the agitator rod 94 by a pin 160 which extends through a slot in the agitator rod 94 so as to permit the agitator rod 94 to reciprocate independently of the sleeve 152 and to cause the rod 94 to rotate with the sleeve 152. The upper end of the sleeve 152 is provided with a flange to which is bolted a flanged tapered member 161 which extends upwardly into a recess formed in the bottom of the tub and is provided with a ball-shaped upper end portion. Resting on this ball-shaped upper end portion is a ball-shaped hard rubber washer 162 upon which rests a socket portion 164 of the bottom casting 166 of the tub 104. This socket portion 164 is provided with a pair of screws 168 which have projections formed on their ends entering into slots 170 provided in the ball-shaped portion at the upper end of the member 160. The projecting portions of the screws 168 provide the driving engagement between the member 160 and the bottom 166 of the tub 104. The screws 168 also hold the hard rubber washer 162 in the socket 164 of the bottom 166 of the tub 104.

In order to seal the upper end of the member 161 as well as the agitator shaft 94 there is provided a bellows type seal member 172 of properly compounded rubber or some other rubber-like material such as "Duprene" or "Neoprene." The lower end of the seal member 172 is provided with a heavy ring which is held between the hard rubber member 162 and the flange of the socket portion 164. The upper end of the seal member 172 is also provided with a ring portion 174 which is clamped between a metal ring 176 which fits tightly upon a reduced portion of the agitator shaft 94 and an agitator mounting member 178 which also fits upon the reduced upper end portion of the agitator shaft 94 and is held in place by the nut 106. The agitator 102 together with its cap 108 form an assembly which is threaded onto the member 178 after the assembly of the washing machine. The bottom 166 of the tub 104 is formed of a heavy cast metal, such as cast iron, zinc or brass and has a conical upwardly extending portion which surrounds the member 160 and is located within the confines of the agitator so that the ball and socket connection may be placed at the proper point so as to provide an inherent static balance of the tub in order that the spinning of the tub may be started without serious vibration. The bottom of the tub is weighted around the rim in such a fashion that no matter how an ordinary quantity of clothes is distributed within the tub, the tub will assume a position so as to compensate for any unbalance.

Water and suds disposal

I have found in most forms of devices of this type that when clothes are dried by spinning, the suds are deposited upon the clothes and thus a thorough rinsing is not accomplished. I have found by constructing and draining the tub in the manner disclosed herein that this deposit of suds may be avoided. My method of accomplishing this is to cause the removal of the water from the central portion of the tub while the tub is being spun. I find that under such conditions the clothes remain against the outer side of the tub while the water bearing the suds remains and is drawn from the central portion of the tub, since the suds are lighter than the water or the clothes. For doing this I provide an angular insert 180 in the bottom of the tub which is provided with a number of comparatively large holes arranged in a circle about midway between the rim and the center of the tub and provide the major outlet from the tub. These holes, designated by the reference character 182, may be of any suitable number and size such as 24 three-eighths inch holes.

Beneath the insert 180 there is provided a passage 184 through which water flows to four sets of passages 186 which extend through the edge of the bottom 166 and connect to a recess 188 formed at the bottom of each of the four vertical risers 190 which are fastened upon the outside of the sheet metal side wall 192 of the tub 104 at four evenly spaced positions. The side wall 192 and the riser 190 are fastened to the bottom 166 of the tub by the screws 194 and this joint is sealed by a suitable gasket. The side walls 192 are tapered inwardly as they extend upwardly from the top of the bottom member 166. This taper is preferably at an angle of from 7 to 10 degrees. A few small holes 196 are provided through the side walls 192 at the bottom of the tapered portion and located at four different portions of the wall so that they communicate directly with the passage provided by each of the risers 190. These holes are quite small and have a much smaller capacity than the holes 182 and 186. These smaller holes are provided for removing the small portion of the water which cannot readily be removed through the outlets 182 after the major portion of the water has been removed.

The water is drawn through the outlets 182 and 186 and up the risers 190 by centrifugal force since the risers 190 are tapered outwardly and have a spout which overhangs the collecting trough 34. These passages form a centrifugal pump which rapidly expels the water from the tub into the trough from which it flows down through the pipe 36 to the drain. This method of removing water also provides an excellent means for removing the sand and dirt which does not remain in suspension in the water but which collects in the bottom of the tub adjacent the holes 182. The rapid movement of the water from the tub out through the holes 182 carries the sand and dirt with it and so cleans the bottom of the tub. Instead of the four risers 190 the metal may continue around the tub 104 to form a single tub shaped riser.

Floating support

The flange 160 is provided with arms 196 which are connected to links 198 which in turn connect to the lower ends of the supporting rods 38 provided with rubber mountings 201 above and

below the links 198. This provides a floating mounting for the tub and its driving mechanism so that during the spinning operation the entire mass can rotate about its center of gravity with considerable freedom.

Automatic control mechanism

The operation of the washer is controlled by a cam mechanism which is driven from the clutch shaft 62 by a pulley 207 mounted upon the outer end of the clutch shaft 62. This drive pulley 207 through a belt, drives a large pulley 209 which is mounted upon the outer end of a worm shaft 211 extending from the gear case 213, best shown in Fig. 4. This gear case includes the mechanism for driving five cams, which control the water metering valve, the cold water valve, the agitation mechanism, the spinning mechanism and the stopping of the washer. The worm shaft 211 is provided with a worm 215 whithin the gear case 213 which drives a worm gear 217 which in turn is provided with a drive pin 219 connecting the worm gear 217 to a link 221. The link 221 is pivotally connected to a triangular plate 223 pivotally mounted upon the shaft 225 and is located beneath all the gearing and plates shown on the shaft 225. This triangular plate 223 is provided with a pawl 227 which rests upon its upper surface, and through a spring 229 is held in engagement with the teeth of a gear 231 located directly on top of the triangular plate 223.

The rotation of the worm gear 217 causes the link 221 to reciprocate the triangular-shaped member 223 to cause the pawl 227 to engage the teeth of the gear 231 to advance it one or more teeth during each oscillation. The number of teeth which is picked up and advanced by the pawl 227 is controlled by a fan-shaped member 233 which is pivoted upon shaft 225 and has a downwardly turned flange covering the teeth of the gear 231. When the fan shaped member 233 is in the position shown in Fig. 4 the pawl 227 will ride over the turned down flange of this fan-shaped member 233 and thus the number of teeth picked up by the pawl 227 during each oscillation is controlled. When the fan-shaped member 233 is in the position shown in Fig. 4 it will limit the pawl 227 to advancing one tooth for each oscillation.

It should be noted that this fan-shaped member 233 is provided with a projection 235 which engages a pin 237 to limit the movement of the fan-shaped member 233 in a clockwise direction. When the fan-shaped member is moved in a counter-clockwise direction from the stop pin 237, it permits the pawl 227 to pick more than one tooth per oscillation. In order to hold the fan-shaped member 233 in other positions, there is provided a latch means including a double arm member 239 pivoted upon a pin 241 and provided with a torsion coil spring 243 which holds the lower arm 245 with its pointed end portion in one of the holes provided in the flange of the fan-shaped member 233.

As shown, the arm 245 is in the hole limiting the pawl to the picking of one tooth per oscillation. A second hole 247 is provided which, when notched with the arm 245, permits the pawl to pick two teeth per oscillation; a third hole 249 is provided which, when notched with the arm 245, permits the pawl 227 to pick three teeth per oscillation. Finally a fourth hole 251 is provided which, when notched with the arm 245, permits the pawl 227 to pick four teeth per oscillation.

This fan-shaped member 233 is formed integrally with the collar 253 which is fastened by a pin to the shaft 225. This shaft 225 with the fan-shaped member 233 is adapted to be rotated by an inner knob 255 provided upon the top of the washer and is provided with a shaft which connects to the upper end of the shaft 225 by a tongue and slot connection. Through this inner knob 255, shown in Figs. 1 and 14, the speed at which the cams are driven is controlled. The fan-shaped member 233 is urged with its projection 235 against the stop pin 237 by a flat spring 257 which engages at its outer end a turned-up projection from the fan-shaped member 233. This flat spring 257 continues around the far side of the collar 253 and then extends into engagement with the teeth of a pinion 259 and thereby serves as a spring detent for the pinion 259 so as to prevent too free a rotation of this pinion.

The gear 231 is not in mesh with any gear but between it and the fan-shaped member 233 it carries a one tooth gear 261 having a single tooth which is adapted to mesh once each revolution of the gear 231 with the pinion 263. The pinion 263 meshes with the upper gear 265 fastened to a sleeve 267 surrounding the shaft 225. This sleeve 267 like the shaft 225 projects upwardly through the lid 269 of the gear case 213 and has fastened thereon the cams 309, 310, 311, 312 and 313 which correspond in order to the cams shown in Figs. 9 to 13. Thus this mechanism provides for a slow rotation of the cams which is varied in speed by the position of the knob 255, the shaft 225 and the fan-shaped member 233 which determines the number of teeth picked at each oscillation by the pawl 227.

However, it is only desired to provide this variation in speed during the first washing or agitating period and in order to accommodate this I provide means for returning the fan-shaped member 233 to the slow speed position at the end of the first agitating period. In order to do this a three tooth gear 271 is fastened to the sleeve 267 along with and directly beneath the gear 265. This three tooth gear 271 has a downwardly turned projection 273 which is adapted to engage the upper arm 275 of the two arm member 239 so as to lift the pointed end of the lower arm 245 out of any one of the notches in the flange of the fan-shaped member 233 which will allow the fan-shaped member 233 to turn in a clockwise direction under the influence of the flat spring 257 to move the projection 235 against the stop pin 237. This will insure the remaining portion of the washing operation to be controlled by the cams operating at the slow speed.

The electrical circuit

Referring now to Figs. 9 to 15, and more paricularly to Fig. 9, there is shown a wiring diagram which includes the driving motor 50 connected to the supply conductor 315 and by a conductor 317 to an electromagnetic and manual switch 319 which in turn connects to the other supply conductor 321. The electromagnetic switch 319 has a manual operating button 323 and a solenoid holding means 325. A coil spring, located between the solenoid 325 and the switch contact bar 319, normally keeps the switch 319 in an open position. When the switch 319 is in the open position the solenoid 325 is de-

energized, since it is connected in series with the switch 319. However, when the button 323 is depressed the contacts 319 close the circuit not only to the driving motor 50 but also to the solenoid 325, which thereafter holds the contacts 319 in closed position as long as it is energized. The solenoid 325 is connected by conductor 327 to a switch 329 which is normally closed by a compression type coil spring 331. The switch 329 is formed as a part of a cam follower 333 which is acted upon by the cam 309 when the sleeve 267 has made one complete revolution, and thus has completed all the advance necessary for a complete washing. When the cam 309 engages the follower 333 the switch 329 is opened to deenergize the solenoid 325 to cause the solenoid 325 to release the switch contacts 319 to open both the motor and the solenoid circuit thus completely deenergizing the washer.

The water control

The cam 310 controls the admission of water into the tub. This cam 310 is provided with projections 310*a*, 310*b*, 310*c* and 310*d*. These projections are adapted to engage a valve stem head 310*e* provided upon the end of the valve stem of a control valve 310*f* provided in the water metering valve mechanism generally designated by the reference character 335. This water metering valve 335 includes a cold water inlet pipe 337, the hot water inlet pipe 339, a valve casing 341 providing a mixing chamber 343. This mixing chamber 343 includes a bi-metal thermostat 345 which operates a butterfly valve 347. This valve 347 controls the flow of water which passes through the cold water valve 349 from the cold water inlet pipe 337. When the cold water valve 349 is kept closed, only hot water will be supplied to the washer even though the butterfly valve 347 opens under the influence of the bi-metal 345.

The mixing chamber 343 is connected by a valve opening 351 with a discharge chamber 353 connecting to the outlet connection 355 of the metering valve 335. As shown in Fig. 1, this valve outlet connection 355 is connected by piping 357 to a nozzle 359 extending over the rim of the tub 104 in order to discharge water into the tub. The valve control passage 351 of the metering valve 335 is adapted to be closed by a cone-shaped valve member 361 which is fastened to a diaphragm 363 of properly compounded rubber or other rubber-like material such as "Duprene" or "Neoprene."

The valve member 361 is provided with a restricted passage 365 extending to the other side of the diaphragm 363. The control valve 310*f* opens into the diaphragm chamber 367. When the valve 310*f* is kept closed by its valve spring 310*g* the water will flow through the passage 365 into the diaphragm chamber 367 and will permit the diaphragm 363 to be moved into engagement with the flanged valve seat opening to prevent the flow of water to the tub 104. However, to start the washing period the cam projection 310*b* (see Figs. 3 and 6) first comes into engagement with the follower 310*k* which acts upon the head 310*e* to open the valve 310*f* and to permit the water to be discharged from the diaphragm chamber 367 through the open valve 310*f* to the outlet 310*h* and the pipe 310*q* to the drain pipe 36. This permits the diaphragm 363 to be moved under the pressure of the water in the mixing chamber 343 to a position against the adjustable stop 373. This operation allows a measured quantity of water to flow through the valve opening 371 into the discharge chamber 353 to the tub. The quantity of water flowing through the valve is governed by the size of the passage 365 which controls the amount of water which will flow into the diaphragm chamber 367. The diaphragm chamber 367 must be filled by the water flowing through the passage 365, before the valve opening 351 can be closed.

The tripping of the valve 310*f* by the cam 310 is indicated in the second column in Fig. 15. The black part indicates the tripping which is performed by the cam projection 310*a* and the shaded part indicates the time that the water flows through the valve. At the end of this first interval of time the agitation begins as shown in the fourth column and at the same time the second cam projection 310*b* briefly engages and opens the valve 310*f* to allow another charge of water indicated by a black and a shaded portion in the second column. Both charges are of hot water since the cold water valve 349 has not been opened.

The cam 311 engages a cam follower 311*k* which pivots on the pin 375 to engage the valve head 311*e* which is threaded upon the end of the valve stem 311*f* of the cold water valve 349. This is shown in the third column of Fig. 15. The valve head 311*e* holds a compression type coil spring 311*g* which normally holds the cold water valve 349 in closed position.

The agitation and spinning control

The agitator cam 312 has a long cam projectoin 312*a* providing the first agitation period shown in the fourth column of the chart Fig. 15. This cam 312 operates upon the arm 312*k* provided with a roller follower 312*m* which engages the cam face of the cam 312. This arm 312*k* is provided with a pin 312*n* which engages a slot in a connecting member 312*p* threaded onto the outer end of a clutch control shaft 144. When the high part of the cam 312*a* engages the roller follower 312*m* the clutch control shaft 144 is pushed inwardly causing an engagement of the agitator clutch 70 to cause the agitator 102 to be reciprocated vertically by the pinion 72, the gear 74 and the Scotch yoke construction at the bottom of the agitator shaft 94. This will continue as long as the roller follower engages the high part of 312*a* of the agitator cam 312. The spinning cam 313 operates against roller follower 313*m* provided upon the end of the arm 313*k* which is formed as a part of a double arm with the arm 312*k*, both of which move in unison about the pivot pin 375. Thus it is necessary that the cam follower 313 be upon a low portion of its cam 313 when the roller follower 312*m* is upon the high portion of its cam and vice versa.

The speed-up mechanism

I have found with an ordinary constant speed drive for the cams that there is too long an interval between agitation and the spinning operation. Therefore in order to reduce this interval I have provided a special speed-up mechanism for speeding up the rotation of the gear 265 and the sleeve 267 as well as the cams at the time it is desired to change from agitation to spinning. This is the purpose of the three teeth provided upon the three tooth gear 271. The teeth of this three tooth gear 271 are so located that at the end of each agitation period one of these teeth

will come into mesh with the pinion 259 and when the single tooth of the single tooth gear 261 meshes with the pinion 259 it will provide an additional movement of one or more teeth for the gear 265 which rotates with the three tooth gear 271. Thus this mechanism constitutes a speed-up for the cams at the three periods determined by the location of the three teeth. In order to prevent too great amount of rotation of the cams during this speed-up period I have provided a spring detent 266 for the gear 265 which engages the teeth of the gear 265 to prevent excessive movement but this detent will not prevent ordinary movement of the gear 265 by either the single tooth gear 261 or the three tooth gear 271.

The spinning mechanism

When the roller follower 313*m* engages the high portion 313*a* of its cam it pulls the clutch control shaft 144 outwardly through the medium of the arm 312*k*, the pin 312*n* and the connecting member 312*p* in order to cause the release of the agitator clutch 370 and the engagement of the spinning clutch 68. The tension of the clutch spring of the spinning clutch 68 is such that it will allow considerable slippage before the helical gear 130 will begin to turn and rotate the helical gear 150 and the tub 104. This will prevent too great a strain upon the motor and the mechanism which rotates the tub 104. The universal type of suspension for the tub 104 will prevent vibration during the accelerating period and after the tub gets up to speed the floating support provided by the rods 38 will allow the mechanism to rotate about its center of gravity and thereby will prevent destructive vibration. The spinning or rotation of the tub will then cause the flow of water out of the tub through the holes 182 and the risers 190 into the collecting trough 34 and the drain pipe 36. Thus in this way, after the clothes have been agitated or washed, this wash water is removed from the tub by this spinning operation.

The rinsing and drying operations

While the spinning operation is still in progress, the cold water cam 311 will have its high portion 311*a* come into contact with its cam follower 311*k* and this cam follower 311*k* will depress the cold water valve head 311*c* and will cause water to flow into the mixing chamber 343 of the valve 335 under the control of the thermostat 345 and the butterfly valve 341 as shown in the third column of Fig. 15. No water, however, will flow into the tub until the cam projection 310*c* will operate the cam follower 310*k* to depress the valve head 310*e* of the control valve 310*f* to cause a measured amount of water to flow into the tub as indicated in the second column of Fig. 15. At this time the roller follower 313*m* leaves the high portion 313*a* of the spinning cam 313 thus stopping the spinning of the tub. Thereafter a measured amount of water flows into the tub and then cam projection 312*b* will engage the roller follower 313*m* to cause the engagement of the agitator clutch 70 in order to provide an agitating rinsing period as shown in the fourth column of Fig. 15.

Following this agitating period the second tooth of the three tooth gear 271 will provide the second speed-up period and thereafter the cam projection 313*b* will operate to cause the engagement of the spinning clutch 68 to spin the first rinse water into the drain. Following this, the cam projection 310*d* will trip the water metering valve 310*f* to permit another measured amount of water to flow into the tub and after this interval of time the cam projection 312*c* will cause the engagement of the agitating clutch 272 to cause an agitating period.

Following this third agitating period, which is measured by the length of the projection 312*c*, the agitator clutch 70 will be released and the third tooth upon the three tooth gear 271 will provide the third speed-up period. This will cause the cam projection 313*c* to cause the engagement of the spinning clutch 68 to provide the long spinning period indicated in the fifth column of Fig. 15 which will spin the second rinse water into the sewer and will completely dry the clothes by prolonging the spinning. When the roller follower 313*m* reaches the end of the cam projection 313*c*, the cam 308 will have its projection 308*a* operate the follower 333 to open the switch contacts 328 thereby deenergizing the solenoid and allowing the opening of the contacts 319.

While the form of embodiment of the invention as herein described, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A washing machine including a receptacle, a centrally located supporting means extending upwardly from beneath the receptacle, means for inherently balancing said receptacle including a universal type connection between said supporting means and said receptacle, said connection having its pivot point above the lower half of said receptacle, an agitator within said receptacle, means for operating said agitator including connecting means extending within said supporting means and connecting to said agitator, and means for rotating said supporting means and said receptacle.

2. A washing machine including a receptacle, a centrally located supporting means extending upwardly from beneath the receptacle, means for inherently balancing said receptacle including a universal type connection between said supporting means and said receptacle, said connection having its pivot point above the lower half of said receptacle, an agitator within said receptacle, means for operating said agitator including connecting means extending within said supporting means and connecting to said agitator, and means including locking means for simultaneously rotating said supporting means, said receptacle and said agitator.

3. A washing machine including a receptacle, a centrally located supporting means extending upwardly from beneath the receptacle, means for inherently balancing said receptacle including a universal type connection between said supporting means and said receptacle, said connection having its pivot point above the lower half of said receptacle, an agitator within said receptacle, means for operating said agitator including connecting means extending within said supporting means and connecting to said agitator, said operating means including means for reciprocating said agitator in a vertical direction, and means for rotating said receptacle.

4. A washing machine including a receptacle, a rotatable sleeve below said receptacle, a universal type connection between said receptacle and sleeve centrally located in said receptacle, a vertically reciprocable rod inside said sleeve and universal type connection and extending into said

basket, independent driving means below said receptacle for said sleeve and rod and a vertically reciprocable tubular agitator in said receptacle secured to said rod and spaced around said universal type connection.

5. A washing machine including a receptacle, a rotatable sleeve below said receptacle, a universal type connection between said receptacle and sleeve, a vertically reciprocable rod inside said sleeve and universal type connection and extending into said basket, means to cause said rod to rotate with said sleeve, and a tubular vertically reciprocable agitator in said receptacle secured to said rod and horizontally surrounding said universal type connection.

6. A washing machine including a receptacle having an upstanding central hub, a rotatable sleeve below said receptacle extending into said hub, a universal type connection between said receptacle and sleeve near the top of said hub, a vertically reciprocable rod inside said sleeve and universal type connection and extending into said basket, a vertically reciprocable tubular agitator in said receptacle secured to said rod, and surrounding said hub and spaced sufficiently therefrom to permit said tub to tilt on said universal type connection.

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May 5, 1953 T. R. SMITH **2,637,188**

TUB ASSEMBLY FOR WASHING MACHINE

Filed Aug. 6, 1949 2 SHEETS--SHEET 1

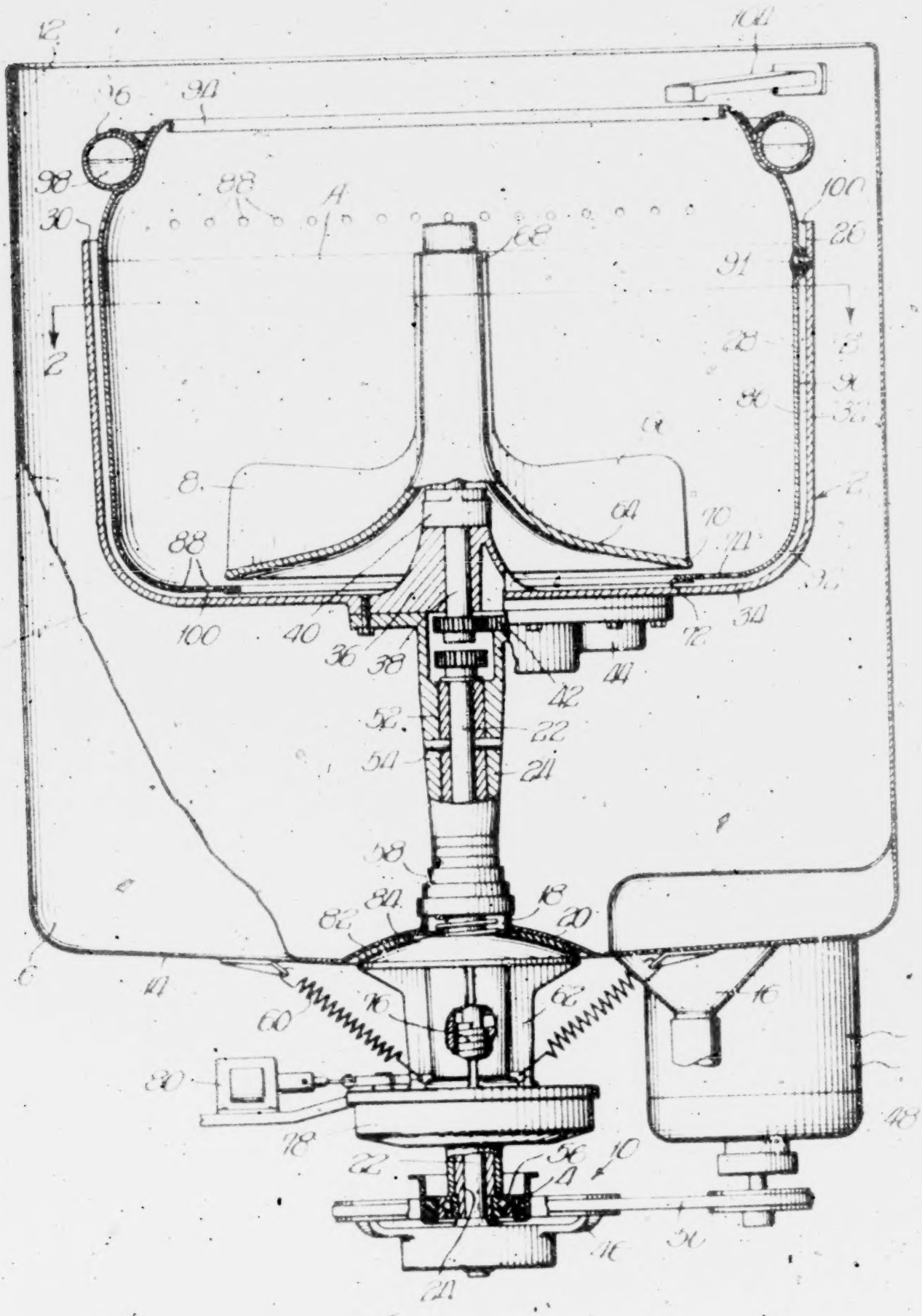

Fig. 1

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TUB ASSEMBLY FOR WASHING MACHINE

Filed Aug. 6, 1949 2 SHEETS—SHEET 2

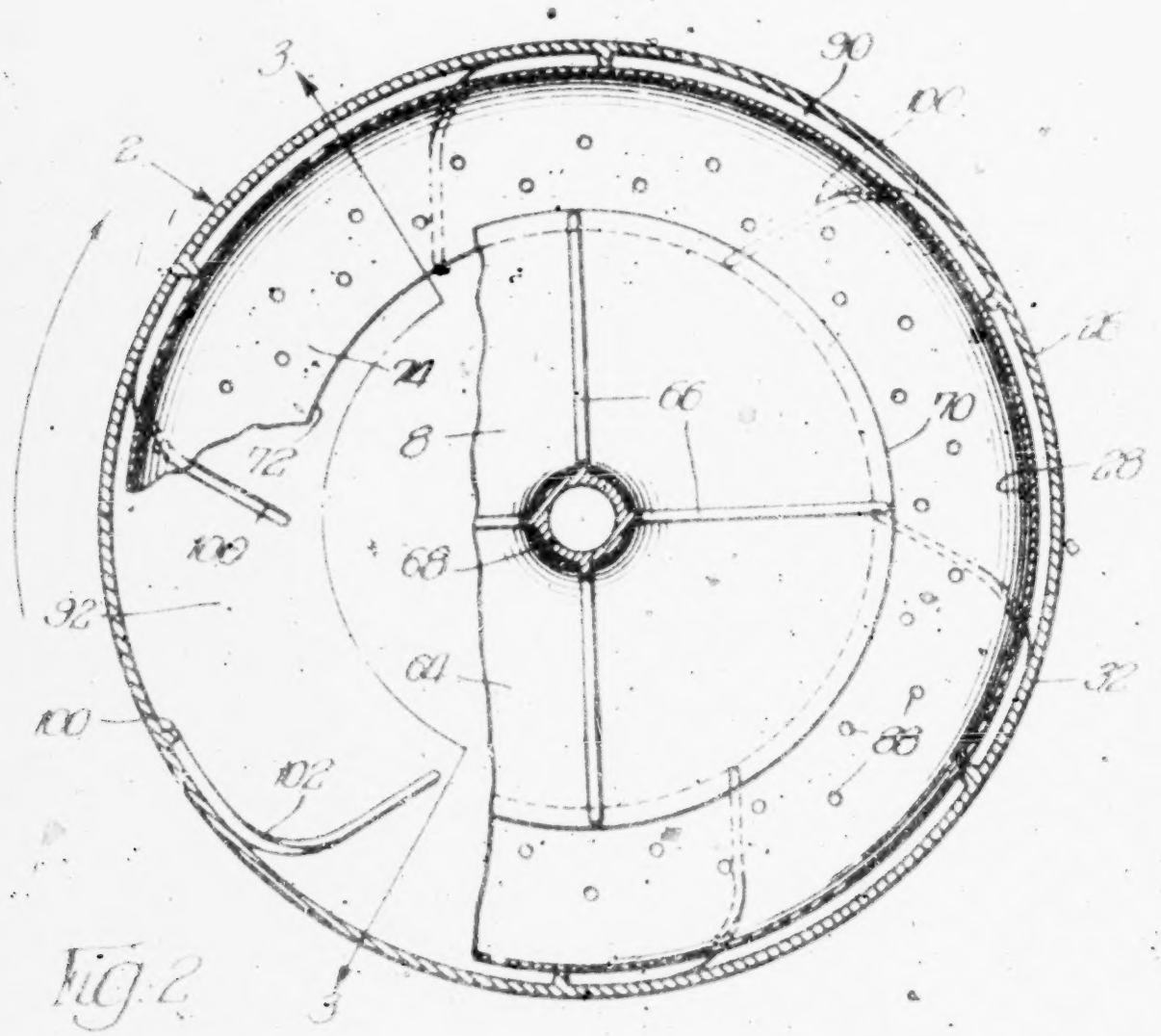

FIG. 2

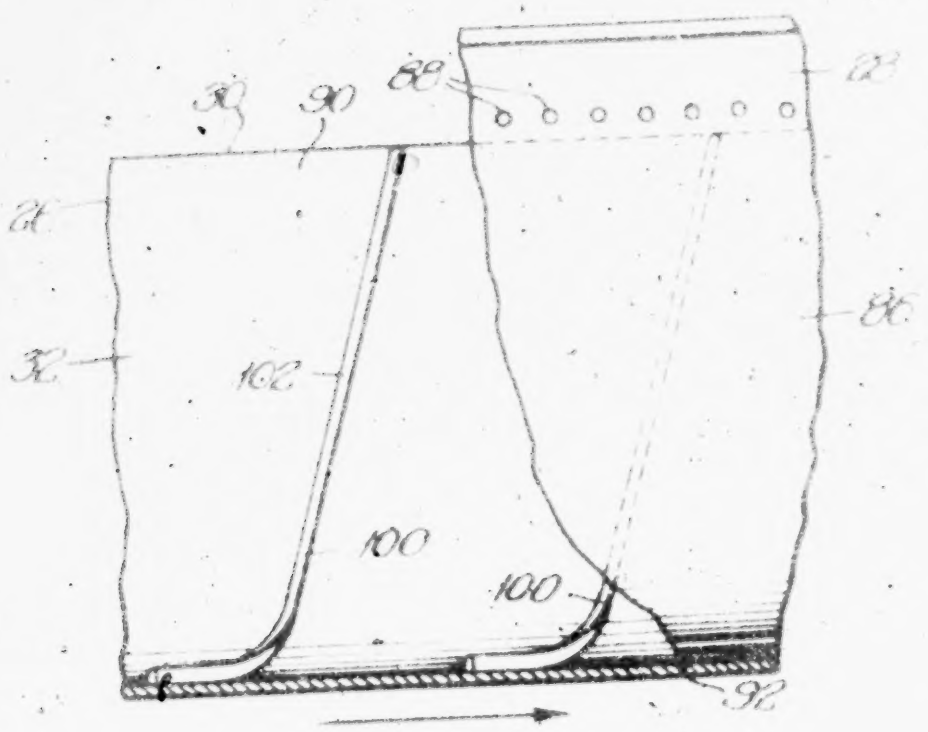

FIG. 3

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TUB ASSEMBLY FOR WASHING MACHINES

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7 Claims. (Cl. 68—23)

1

This invention relates to washing machines and more particularly to washing machines having rotatable tubs of improved construction.

Among the objects of the invention is to provide a washing machine with an improved rotatable tub having means for facilitating the removal of heavy particles of dirt and foreign matter from the tub when the same is accelerated.

In washing machines having rotatable tubs wherein a washing operation and a centrifugal drying operation takes place there are times, when washing some fabrics, that heavy particles of dirt, sand, etc. will settle out of the fabrics being washed. These particles tend to collect in the bottom of the tub during the washing operation and when the tub is rotated to extract the liquid a portion of the heavy dirt or foreign matter may be forced back into some of the fabrics which, of course, causes the same to be spotted or soiled. Even in installations wherein a space or sediment zone is provided for heavy dirt to settle out of contact with the fabrics being washed, the dirt is not always removed therefrom when the tub is rotated and it may accumulate therein until it eventually clogs the sediment zone. This is especially so in installations where the settling space is not readily accessible for manual cleaning.

Accordingly, it is another object of the invention to provide a washing machine with a rotatable tub of double wall construction provided with means therebetween for ejecting heavy particles of dirt from a sediment space located in the lower portion thereof.

It is another object of the invention to provide a washing machine with a rotatable tub of double wall construction which is provided with elevating means to facilitate the removal and conveyance of heavy particles from the lower portion thereof to the outside of the tub through the space between the walls of the tub when the same is rotated.

It is yet another object of the invention to provide a washing machine having a rotatable tub of double wall construction formed to provide a sediment space in the lower portion thereof and having a plurality of vanes between the walls which extend into said sediment space for ejecting liquid and heavy particles of dirt from the sediment space over the top edge of the tub without contacting the fabrics being washed.

Still another object of the invention is to provide a sediment trap in a rotatable tub for a washing machine which is self-cleaning.

Other objects, features, capabilities, and advantages are comprehended by the invention as will later appear and as are inherently possessed thereby.

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Referring to the drawings:

Figure 1 is a partial vertical sectional-view of a washing machine provided with a rotatable tub of double wall construction embodying the improved elevating means of the present invention;

Figure 2 is a broken horizontal cross-sectional view of the rotatable tub taken in a plane represented by line 2—2 of Figure 1 of the drawings and showing the annular liquid conducting space and elevating means the arcuate arrow representing the direction of rotation of the tub; and

Figure 3 is a partial sectional view taken in the planes represented by line 3—3 of Figure 2 of the drawings and disclosing the elevating means in detail. The arrow indicates the direction of rotation of the tub.

Referring now more in detail to one form of a combined washing and drying machine, embodying a rotatable tub of double wall construction 2 mounted for rotation about a vertical axis and made in accordance with the present invention, there is shown a base structure 4 which provides a support for an outer stationary tub 6, a support for the inner rotatable tub structure 2, having a centrally located vertically mounted agitator or washing device 8 disposed therein; as well as a support for mechanism generally referred to as 10, for operating the agitator and for rotating the tube 2 in a washing cycle, as will be hereinafter more fully described.

The outer stationary tub 6 may be supported from the base 4, in any suitable manner, and is preferably formed circular in horizontal cross-section, with an upper open end 12 disposed above the top of the rotatable tub 2 to intercept and deflect downward any liquid discharged from the tub when it is rotated. The stationary tub 6 further includes a lower bottom wall 14 having a drain opening 16 and a centrally disposed enlarged opening 18 in a crowned portion 20 through which vertical coaxial shaft means extend. The shaft means is in the form of an inner rotatable shaft 22 and an outer rotatable tubular shaft 24, for supporting and rotating the inner tub 2 and for actuating the agitator 8.

Disposed within and at the upper portion of the outer stationary tub 6 and secured to the upper end of the outer tubular shaft 24 is the inner rotatable tub 2, also preferably circular in horizontal cross-section, which comprises two separate sections to provide an outer tub or re-

ceptacle 26 and an inner tub or container 28. The outer tub or receptacle 26 is imperforate and substantially cup-shaped in vertical cross-section with its open end facing upwardly and terminating to define a top edge 30 above the normal liquid desired in the tub and over which the liquid is discharged when the tub is rotated. This receptacle comprises an upwardly and outwardly directed frusto-conical side wall 32 which merges at its lower end with a generally horizontal bottom wall 34 having a centrally located raised hub portion 36 thereon. Projecting through and upwardly from the hub 36 is a vertically disposed oscillatable shaft 38 splined or connected in any suitable manner to the agitator 8 for actuating or oscillating the same about its vertical axis to agitate the water and fabrics to be washed within the tub. Any suitable sealing means 40 may be utilized between the hub 36 and the shaft 38 to provide a fluid-tight joint.

Means for oscillating the agitator are provided by suitable oscillating mechanism generally indicated at 42 which, in this construction, is carried in a gear housing 44 disposed at the bottom of and bolted to the outer tub 26 to increase the mass thereof. This oscillating mechanism is preferably directly operated by the inner vertically disposed rotatable shaft 22 which has a driven pulley 48 secured thereto at its lower end, the same being continuously rotated in one direction by a motor 48 when energized, by means of a belt 50.

The gear housing 44 is further provided with a downwardly projecting hub 52 concentric with the shaft means and rigidly secured to the upper end of the outer tubular shaft by means of pins 54, while the lower end of the shaft means 22 and 24 is mounted in a combination radial and thrust bearing 56 adjacent the lowermost portion of the base 4. Leakage between the outer hollow shaft 24 and stationary tub 6 is prevented where the shaft means traverses the tub at the crowned opening 20, by means of a resilient spring biased seal or boot 58 having upper and lower sealing surfaces adapted to engage the lower portion of the hub 52 and an upstanding portion on the stationary tub about the opening 18, respectively.

The combined radial and thrust bearing 56 provides the sole support for the rotatable tub which is free to tilt thereabout at which time the tub is capable of moving laterally. Accordingly, means are provided to maintain the tub in a substantially vertical position during the washing operation and, although it is not absolutely necessary, it is desirable to have the means act to aid in centering the same when the tub is rotated. In this instance, a plurality of oppositely disposed, preferably four, centering springs 60 disposed at an angle to produce a component of force axially of the shaft means, in addition to the centering action, are connected at one of their ends to the bottom of the stationary tub 6 and the opposite ends are connected to a damper housing 62 disposed adjacent to and beneath the bottom of the stationary tub. This damper housing is also disposed concentric with and journalled on the outer shaft 24 and moves laterally therewith.

The agitator 8, disposed within the rotatable tub 2, is formed with a flaring base or body portion 64 extending downwardly and outwardly about the hub 36 to underlie the clothes, and has one or more blades 66 extending radially upwardly and outwardly from the upper portion of the base adapted to agitate the liquid within the tub upon oscillation of the agitator for effecting the washing operation. The agitator is further provided with a center-post 68 disposed on the vertical axis of the tub and extends upwardly above the normal liquid level within the tub. Also, the outer periphery 70 of the base 64 preferably extends outwardly and covers the inner end 72 of the bottom wall 74 of the inner tub 28 to prevent fabrics from entering thereunder.

As previously mentioned, the material introduced into the rotatable receptacle 2 is subjected to a washing action through the oscillating action of the agitator 8 and is also subjected to a centrifuging action whereby the same is spin-dried upon the rotation of the tub. In order to rapidly rotate the tub, suitable clutch mechanism 76 carried in the damper housing 62 may be provided for affecting a driving relation between the inner shaft 22 and the outer shaft 24. Means are provided in the form of a brake mechanism 78 secured in part to the stationary tub 6 and to the outer shaft 24 for holding the tub stationary during the washing operation and permitting the rotation of the tub during the spinning operation. The operation of both the brake 78 and the clutch 76 is under control of an electrically operated solenoid 80 which when deenergized applies the brake and renders the clutch inactive and when energized releases the brake and engages the clutch to connect the inner and outer shafts 22 and 24 together to drive the same in unison.

The damper housing 62 which provides a support at least in part for the clutch and brake mechanism and has the centering springs connected thereto, is also provided at its uppermost end with a spherical surface 82 having dampening material 84 attached thereto which is positioned to engage the crowned portion 20 of the stationary tub 6. This damper is provided to reduce the amplitude of lateral movement of the receptacle during the spinning operation.

A clutch, centering means, brake and damper mechanisms suitable for affecting the above operation are described and claimed in my copending application Serial No. 66,230, filed December 20, 1948, and assigned to the assignee of the present invention. It is to be understood, however, that said application discloses but one form of such mechanisms suitable for operating a washing machine as herein disclosed and that other suitable types may be utilized.

Referring now more particularly to the details of construction of the tub assembly 2 which is rotatable about its vertical axis there is shown the substantially imperforate outer tub or receptacle 26 which includes the generally horizontal bottom wall 34 and the slightly upwardly and outwardly flaring cylindrical side wall 32 having the top edge 30 disposed above the normal liquid level desired therein. It is to be noted that the lower portion of the side wall 32 and outer portion of the bottom wall are curved gradually to provide a smooth surface in order to prevent heavy foreign particles from being held in the corner.

The inner tub 28 is in the form of an open-ended basket or container having its side wall 86 adjacent the top edge 30 of the receptacle and the bottom wall 74 provided with perforations 88. The inner tub is disposed in substantially parallel spaced relation with the side wall 26 and the bottom wall 34 of the imperforate receptacle to pro-

vide an upper annular space 90 between the side walls 82 and 86 and a lower radially extending space 92 between the bottom walls 84 and 74 to permit free flow of the washing liquid out of the receptacle and over the top edge 30 upon rotation thereof without contacting the fabrics. In addition, the openings 88 in the bottom of the basket permit heavy particles of dirt and foreign matter to flow therethrough and settle in the lower space 90 during the washing operation. Therefore, the space 92 defines a sediment zone or space which functions in a manner to be hereinafter described.

The basket 28 may be secured to the receptacle 26 to form a unitary structure in any suitable manner, such as, for example, by screws or bolts 91, and has its lower innermost portion disposed in spaced relation to the bottom edge of the agitator and to the bottom 34 of the receptacle to permit free flow of washing liquid under the agitator around the edge 72 and into the sediment zone 92. The upper portion of the basket is preferably imperforate and extends upwardly and inwardly above the normal liquid level and terminates to define an opening 94 whereby the operator may have access to the interior of the basket.

In this particular construction, a hollow toroidal balancing member or ring 96 is mounted upon the upper portion of the basket and preferably contains a mobile material 98, of any suitable type, having a relatively high specific gravity which serves as a balancing means for tending to maintain the rotatable tub 2 in its vertical position when it is rotated at relatively high speed, above its critical speed, under unbalanced load conditions.

Disposed within the space between the receptacle and basket there is provided a plurality of inclined elevating ribs or impelling vanes 100 which preferably extend from the upper edge 30 of the tub downward within the space 90 and into the sediment space 92 and terminate adjacent the inner edge 72 of the basket. The inclination of these vanes is such that the lower ends thereof are spaced forwardly of the upper ends in the direction of rotation of the tub, or to state it otherwise, the vanes are inclined upwardly in a direction opposite to the direction of rotation of the tub. These vanes are preferably substantially equal to the thickness of the space 90 and are shown herein as being formed integral with the receptacle. It is to be understood, however, that these ribs may be formed integral with the basket structure or, if desired, the same may be formed as separate members and secured to either the receptacle or the basket.

When the tub is stationary during the washing operation the liquid within the basket is agitated rather violently by the agitator 8 and due to this action a small portion of the liquid is caused to circulate between the interior of the basket and the space between the basket and the receptacle through the openings 88 in the bottom wall 74 and carries with it heavy dirt and other foreign particles removed from the soiled fabrics which tend to settle therein because the liquid in this space has a tendency to be relatively quiet. Thus, the foreign particles are restricted or retarded in their flow back toward the interior of the basket and the major portion of these particles for the most part will remain in the sediment zone.

After the washing operation the tub is rotated to centrifugally extract the liquid therefrom. As the tub is accelerated and there is relative motion between the tub and the liquid the inclined vanes 100 act in effect as a centrifugal pump to elevate the liquid upwardly from the sediment zone 92 through the annular space 90 and over the top edge 30 of the tub. It is obvious that the greater the accelerating force the more liquid the vanes will force through the annular space 90 and in so doing a relatively large quantity of liquid flows through the perforations 88 in the bottom of the basket and through the passageway beneath the agitator and around the edge 72 into the sediment zone 92, and in so doing it will pick up the heavy dirt and carry the same upward therewith and out of the tub and deposit the same in the stationary tub 6 wherein it is conducted to the drain 16.

It has been found that by inclining the ribs in the manner hereinbefore indicated at an angle on the order of from 10 to 30 degrees that the major portion of the heavy dirt is caused to climb up the inclined leading edge 102 on the vanes 100 and be thrown out of the tub on the initial acceleration. Also, these vanes are effective to remove heavy dirt when liquid is sprayed into the tub during the spinning operation. In addition, the vanes act to restrict the movement of the liquid in a horizontal plane during acceleration of the tub. The number of vanes or ribs used depends upon various conditions and satisfactory results have been obtained with two ribs. When the tub has attained full speed the effect of the ribs is negligible in that the centrifugal force and the outwardly flaring shape of the annular space 90 will conduct the liquid out of the receptacle without them.

The operation of a washing machine herein-above described and incorporating a tub of double wall construction with elevating vanes therein made in accordance with the invention is as follows:

The operator places the clothes or fabrics to be washed through the opening 94 into the interior of the basket 28 including with it the proper quantity of detergent. Thereupon the operator may manipulate a dial to select the proper water temperature and to adjust other control mechanism (not shown) to determine the washing cycle which conducts water into the rotatable tub through a nozzle 104 disposed at the upper portion thereof.

When the liquid in the tub reaches a predetermined level a control mechanism (not shown) interrupts the flow of water and the drive motor 48 is energized to start the washing operation by oscillating the agitator 8 through the oscillating mechanism 42.

During the washing operation heavy particles of foreign matter and dirt removed from the fabrics gravitate toward the bottom of the tub and are carried by the washing liquid through the openings 88 in the bottom 74 of the basket 28 where a relatively large portion tends to collect in the sediment zone 92 due to the less violent circulation of water therein. After a predetermined period of agitation, the brake solenoid 80 is energized to release the brake 78 holding the rotatable tub 2 to permit rotary movement thereof and at the same time to cause the clutch 76 to be engaged to directly connect the continuously rotated drive shaft 22 to the hollow rotatable shaft 24 carrying the tub to rotate the same, at which time no relative movement takes place between the agitator and the tub.

As the tub is accelerated by the drive motor 48 the liquid initially tends to remain stationary and the vanes 100 act to scoop or pump the water in

the sediment zone 92 and annular space 90 upwardly and discharge the same over the top edge 30 of the receptacle 26. In so doing additional water flows from the interior of the tub through the perforations 88 in the bottom of the basket and around the edge 72 on the bottom wall into the sediment zone to create a relatively high velocity therethrough to thereby remove the foreign particles therefrom. Also, the liquid is discharged through the horizontal perforations in the side wall of the basket adjacent the top edge of the receptacle.

When the liquid level passes the outermost perforations in the bottom wall, flow through the annular space 90 is terminated and the remaining liquid is conducted through the perforations provided in the upper portion of the side wall 86 of the basket. At full speed of rotation the major portion of liquid is removed from the fabrics and during this time a flush rinse of water is admitted to the tub through the inlet nozzle 104 to remove a portion of the remaining soapy water and at which time the relative movement between the water and the tub permits the vanes to remove the water and the remaining heavy dirt entrained therewith very rapidly At the end of the spinning operation the brake solenoid 80 is deenergized and in so doing applies the brake 78 and releases the clutch 76 to stop and hold the tub stationary. Warm water for rinsing is thereupon admitted to the tub through the nozzle and upon attaining the proper level the flow of water is terminated and the drive motor 48 is energized to initiate the agitate rinse period.

The operation of the washing machine during the rinse period is identical to the operation thereof during the washing period, except it is of shorter duration, after which the tub is again rotated and the vanes 100 act to expel a relatively large quantity of water initially from the tub and to discharge the same over the top edge thereof. At the end of the final spin period, the brake solenoid is deenergized to reapply the brake to the receptacle to stop the same. During this washing cycle the fabrics have been washed with detergent, rinsed with clear water, and have had a large portion of the water removed therefrom. The washing operation is now completed, and the operator need only remove the fabrics from the tub.

The details of construction and the operation of an entire control assembly including an unbalance safety switch, suitable for controlling a washing machine of the type herein disclosed is more fully described in the co-pending application of Thomas R. Smith and Dudley P. Combs, Serial No. 64,792, filed December 11, 1948, now Patent No. 2,612,766, issued October 7, 1952, and assigned to the assignee of the present invention.

From the foregoing it can be seen that a rotatable tub of double wall construction for washing machines has been provided with an annular space therebetween and a self-cleaning sediment zone adjacent its lower portion having vanes disposed in the space and zone so that, when the tub is accelerated, the vanes act to remove a relatively large quantity of water therefrom and at the same time carry with it heavy dirt and foreign particles from the sediment zone.

While I have herein described and upon the drawings shown an illustrative embodiment of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit thereof

It is claimed:

1. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, said tub comprising an imperforate outer tub having a bottom wall and an upwardly flaring side wall with an upper open end extending above the normal liquid level therein, and an open ended inner tub disposed in said outer tub to provide a space therebetween along the side and bottom walls of said outer tub, means for securing said inner and outer tubs to provide a unitary structure, means for providing communication between the interior of said inner tub and the space at the lower portion thereof, and mechanical liquid elevating means disposed in said space, whereby when said tub is accelerated said elevating means act to remove the liquid therein out of contact with the fabrics in said inner tub.

2. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material and being provided with an agitator having a part underlying the fabrics to be washed, said tub comprising an imperforate receptacle having a bottom wall and an upwardly and outwardly flaring side wall with an upper open end, and an open ended basket secured in said receptacle in spaced relation thereto to provide an annular space between said side walls and a sediment space at the bottom of said receptacle, said basket having its lower inner end terminating adjacent the outer periphery of said agitator, means for conducting liquid from the interior of said basket into said space, and inclined mechanical liquid elevating means disposed in said spaces for ejecting liquid therefrom when said tub is accelerated.

3. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, said tub comprising an imperforate receptacle having a bottom and an upwardly and outwardly flaring side wall terminating in an upper edge above the normal liquid level desired in said tub, a container secured in said receptacle in spaced relation thereto to provide an annular liquid conducting space therebetween and from the bottom of said receptacle to define a sediment zone, said container being provided with openings to permit the flow of liquid into the receptacle, and a plurality of vanes disposed in said space and sediment zone inclined upwardly in a direction opposite to the direction of rotation of said tub for ejecting the liquid and sediment therein when said tub is accelerated.

4. A tub for a washing machine adapted to be rotated about a vertical axis, comprising an imperforate receptacle having side and bottom walls, an open-ended container having an imperforate side wall and an inwardly extending bottom wall having discharge openings therein, the bottom and side walls of said container and receptacle being spaced apart to define an annular liquid conducting space between said side walls and a sediment space between said bottom walls, a plurality of vanes extending from said sediment space into said annular liquid conducting space for ejecting liquid from said spaces to flush said sediment space when said tub is accelerated, and means for securing said container and receptacle in spaced relation to provide a unitary structure

5. In a washing machine having a tub adapted to receive liquid and material to be washed and to be spun to centrifugally extract the liquid from the material, and being provided with an agitator having a part underlying the fabrics to be washed, the combination of a tub adapted to be rotated about a vertical axis, comprising an imperforate receptacle having side and bottom walls, an open-ended container having an imperforate side wall and an inwardly extending bottom wall having discharge openings therein, the bottom and side walls of said container and receptacle being spaced apart to define an annular liquid conducting space between said side walls and a sediment space between said bottom walls communicating with the interior of said container through said discharge openings, said container having its lower inner end terminating adjacent the outer periphery of said agitator to provide a liquid passage from the interior of said container into said sediment space, a plurality of vanes extending from said sediment space into said annular liquid conducting space in an inclined direction opposite to the direction of rotation of said tub for ejecting liquid from said spaces to flush said sediment space when said tub is accelerated, and means for securing said container and receptacle in spaced relation to provide a unitary structure.

6. A rotatable tub for receiving washing liquid and fabrics to be washed and mounted for rotation about a vertical axis, comprising an open-ended container having a bottom wall and a side wall with liquid conducting openings therein, an imperforate receptacle having an upwardly flaring frusto-conical side wall and a substantially horizontal bottom wall spaced from the lower portion of said container to define an annular liquid conducting space between said side walls and a sediment space between said bottom walls, said sediment space being in communication with the interior of said container, mechanical liquid elevating means disposed in said annular space and sediment space inclined upwardly in a direction opposite to the direction of rotation of said tub to eject the liquid and sediment therein when said tub is accelerated, and means for securing said container and receptacle together to form a unitary structure.

7. A rotatable tub for receiving liquid and fabrics to be washed and mounted for rotation about a vertical axis, comprising an open-ended container provided with a side wall and a bottom wall extending radially inward and having openings therein, an imperforate receptacle having an upwardly flaring frusto-conical side wall extending above the normal desired liquid level therein and a substantially horizontal bottom wall secured in substantially parallel spaced relation to said container to define an annular liquid conducting space between said side walls and a sediment space between said bottom walls, and a plurality of mechanical liquid elevating means disposed across said spaces to restrict the free flow of liquid in a horizontal plane, whereby when said tub is accelerated said elevating means ejects the liquid from said spaces to flush said sediment space.

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